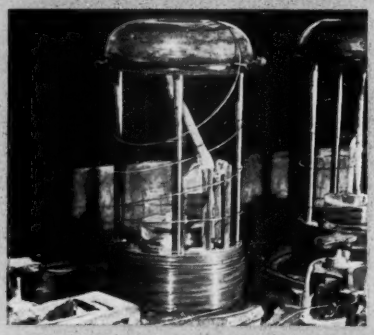
WIRE AND WIRE PRODUCTS

JUNE 1942



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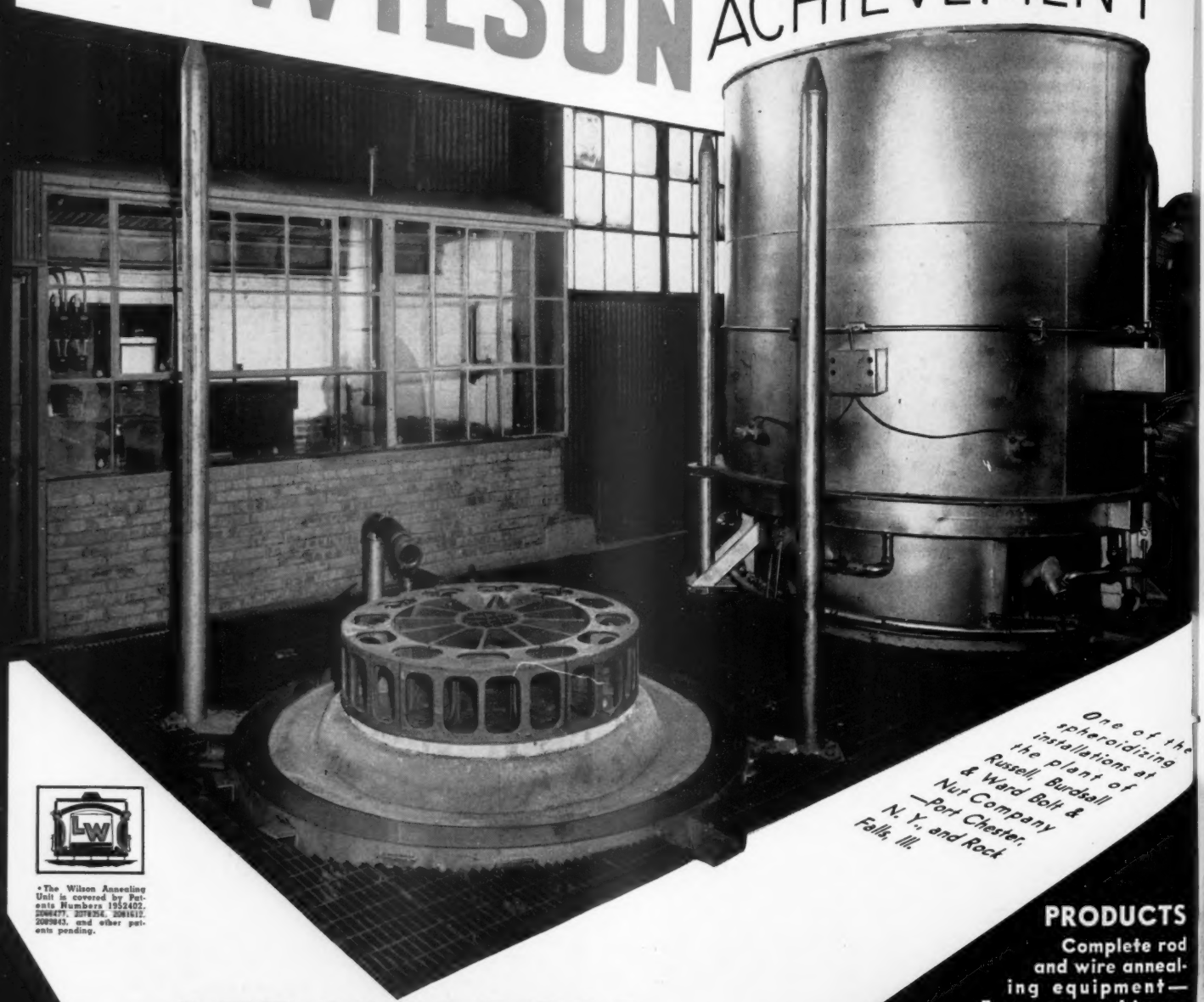

One of the spheroidizing installations at the plant of Russell, Burdsall & Ward Bolt & Nut Company —Port Chester, N. Y., and Rock Falls, Ill.

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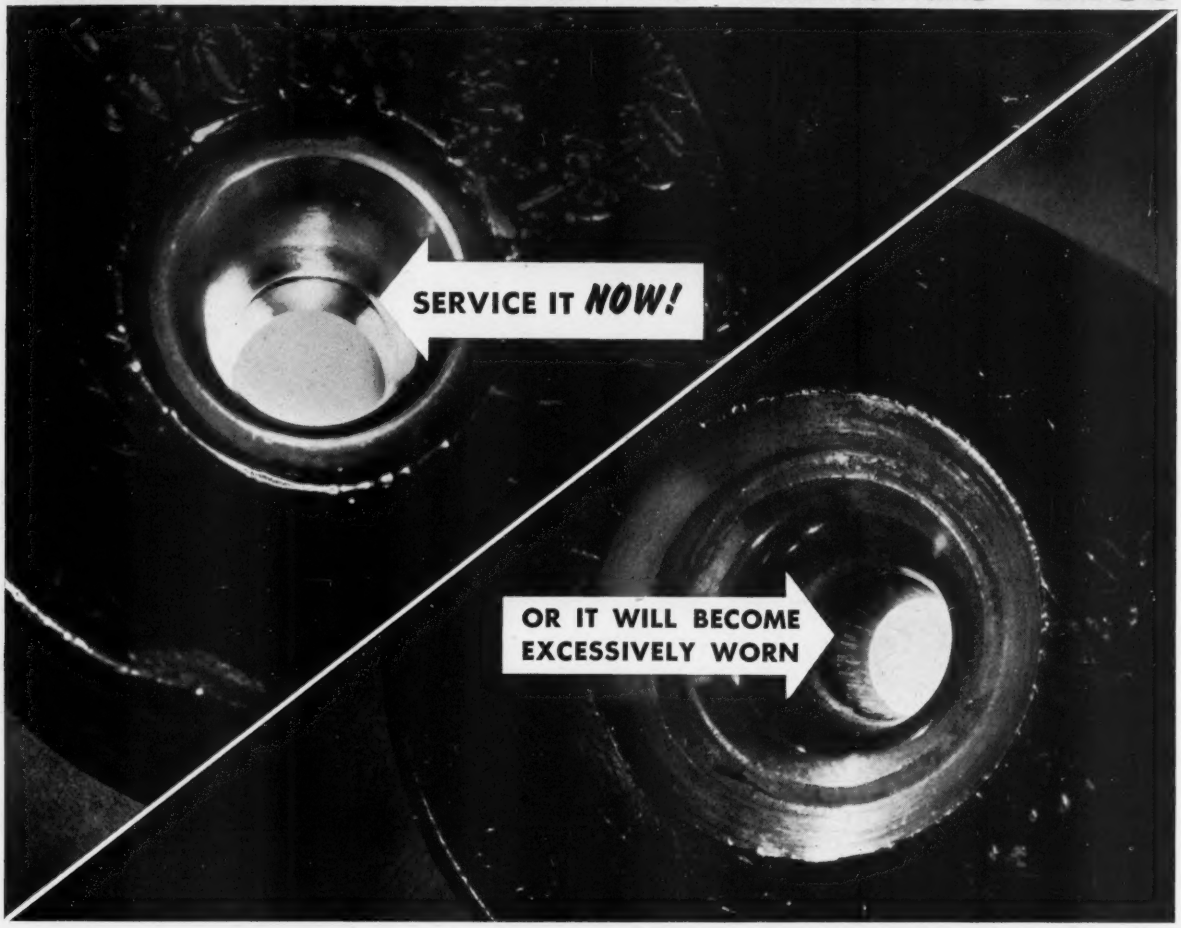

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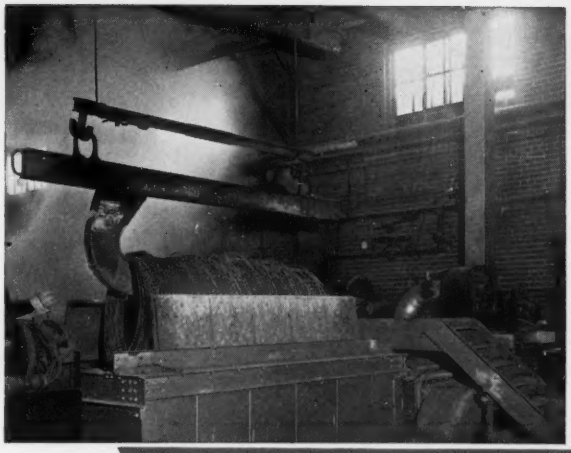

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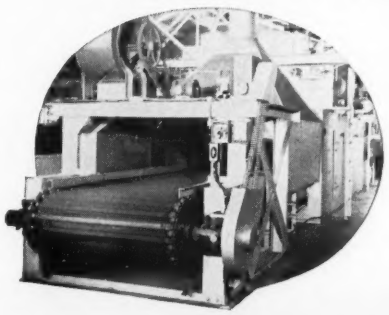

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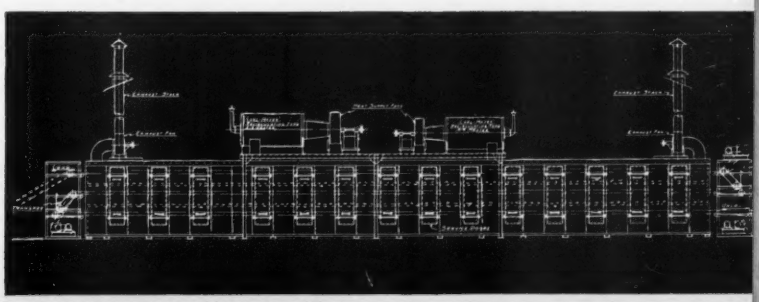

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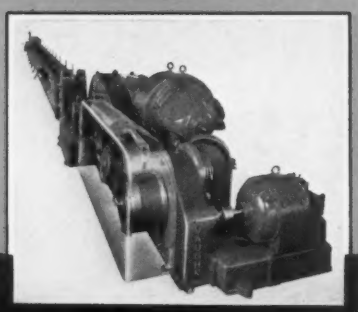

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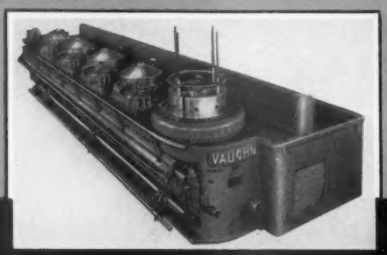

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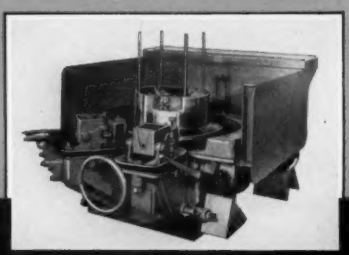

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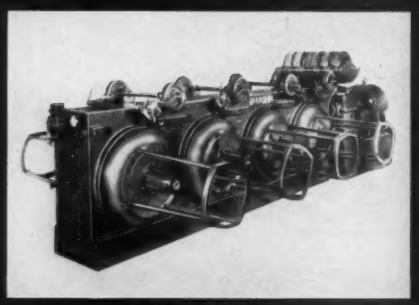

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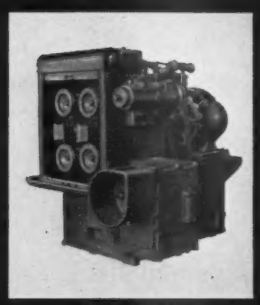

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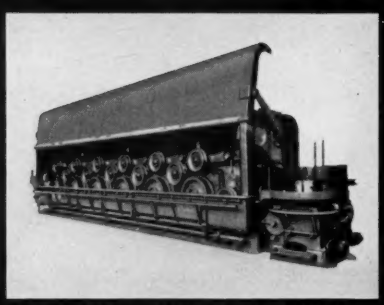

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 17 JUNE, 1942 No. 6

Designated as

Official Publication By The Wire Association

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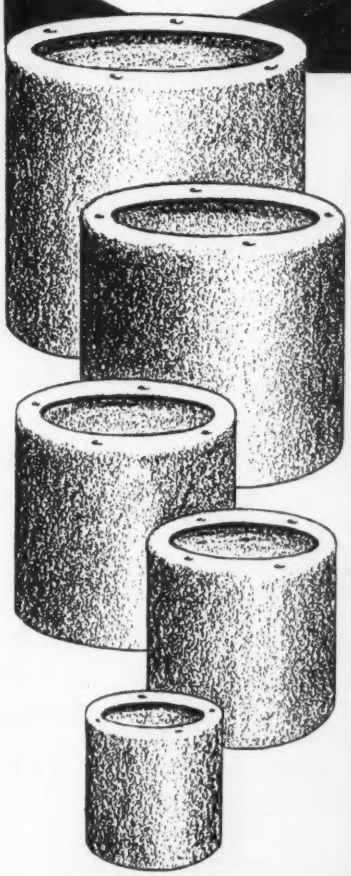

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Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 17 JUNE, 1942 No. 6

Zinc Coating On Wire

By F. R. Morral

Assistant Professor of Metallurgy, School of Mineral Industries,
Pennsylvania State College, State College, Penna.

(Published in Two Parts)

PART I

A discussion of the fundamental operations necessary to make a coated wire to specification together with a consideration of possibilities of improvement in methods now in use.

THE purpose of this article is to discuss the fundamental operations necessary to make a coated wire to specifications; presentation of methods used in other branches of technology which may have application to more successfully accomplish the item above; and possibilities of improvement in the methods already in use with the possibility of reducing waste of metals.

✦ ✦ ✦

WAR requires great quantities of metals, and therefore all waste must be eliminated; particularly of those metals which are being used for civilian consumption, so as to make them go further. This is therefore a good time to improve on all the time honored methods which, because our grandfathers had developed them, or because the work has been considered dirty, have had little attention from the metallurgist.

✦ ✦ ✦

IRON rusts and it is necessary to protect it where it is to be used for war purposes as well as for civilian purposes. Throughout the years a number of metals have been found to serve as good coatings for iron and steel. In the last 200 years methods have been developed to coat iron and steel with zinc, tin, copper, lead, aluminum, etc.

F. R. MORRAL

Received B.S. degree Electrochemical Engineering, Massachusetts Institute of Technology 1932; Doctor of Philosophy, Purdue University, 1940. X-ray diffraction research on iron alloys, University of Stockholm and Metalografiska Institut, Sweden (1932-4). Metallurgical and electrochemical research, University of Barcelona, Spain (1934-36). Research Fellow, Purdue University 1937-38; Research Metallurgist, Continental Steel Corporation, 1936-41; Assistant Professor of Metallurgy, The Pennsylvania State College, 1941 to date. Member: American Society for Metals; American Institute for Mining and Metallurgical Engineers; Electrochemical Society; British Institute of Metals; British Iron and Steel Institute; American Society for X-ray and Electron Diffraction, Sigma Xi.

✦ ✦ ✦

THESE metals are coated on steel by one of the methods known as hot dipping, electroplating, diffusion, spraying, and cladding. The first two are the most common. Treatises and numerous articles have been written to explain these methods of coating and the advantages of each. The phrases used to describe the various steps of a process have often been different. In certain cases some coating processes have been shrouded in mystery and claims made of some extraordinary good qualities.

✦ ✦ ✦

A STUDY of the fundamentals involved in the coating of iron and steel with a metal, non metal or other type of coating,—such as a chemical coating, or

Designated as Official Publication by the Wire Association

TABLE I

Wire Galvanizing—Fundamental Operations

I. Preparation	1.	2.	3.	4.	5.
1. Annealing	Lead, muffle molten salts	Oxidizing to blue	HCl gas at 1100F-1300F	Lead	Molten NaOH 100-150 amps./sq. ft.
2. Cooling					
3. Cleaning				Meaker solution	
4. Washing					
5. Pickling	18° Be HCl			18° Be HCl	
5. Washing	water			water	water
II. Activation					
7. Method	NH_4Cl, $ZnCl_2$ or both in solution; molten flux	Reducing atmosphere		Series of anodic flashes	Anodic flash
III. Coating					
8. Medium	molten zinc	Molten zinc		Electrolyte, $ZnSO_4$	
	air	controlled atmosphere		Soluble Anode	Insoluble Anode
A. Control	wipes	wipes		Current Density	
B. Speed		20 to 250 ft. per minute			
C. Temperature	825-900F			40-50F	30-40F
D. Analysis	Prime Western	Pure Zn		Pure Zn	Zn ore
IV Finishing					
9. Method	Cool in air	Controlled atmosphere		Water rinses	Rinses
	Quench in water			cold	Polish
	Heat Treatment	oil finish		warm	a) dies
	a) galvanneal				b) brushing
	b) flameseal				

even a paint,—shows the similarity amongst them. Such a study also becomes necessary in times like these to give a clear picture in the short time available.

✦ ✦ ✦

COATINGS must meet specifications, which require several or all of the following items to be met:

1. **stipulated weight of coating**
2. **uniformity of coating**
3. **adherence**
4. **appearance.**

✦ ✦ ✦

TO obtain these certain fundamental operations are necessary and they will be illustrated by means of the two most common methods of coating iron and steel with zinc; namely hot dipping and electro-galvanizing. Nevertheless it should be emphasized that the same fundamental operations apply to other coatings mentioned above, although some of the details will vary. This will be found even within the same method of coating as shown further on.

✦ ✦ ✦

THE unit operations and some of the details inherent to the hot galvanizing and electrogalvanizing of wire are illustrated in schematic form in Table I. These fundamental processes are four:

1. **Preparation of the base metal**
2. **Activation of the base metal**
3. **Coating**
4. **Finishing of the coating.**

✦ ✦ ✦

TO accomplish the purpose of each fundamental operation one or more steps may be necessary. Developments of the last few years have made possible the actual reduction of these various steps. Amongst the processes shown in Table I there is one which is only in the experimental stage and is being developed for sheets, although its use for wire is feasible. Another process has possibilities because of analogy with other metallurgical processes (*).

✦ ✦ ✦

I. Preparation of Wire to be Coated

IT is assumed here that the making and shaping of steel to the wire stage is well known. The preparation of the wire to be coated has essentially two purposes:

1. **change the physical properties of the drawn wire to specifications.**
2. **remove surface impurities, such as scale, drawing compounds, baked on lime, and grease.**

✦ ✦ ✦

IN column 2, Table I, the various steps used to accomplish the preparation of steel are listed for the oldest method of coating, the time honored hot galvanizing process. The annealing of the wire may be accomplished by passing it through one or more lead pans at the proper temperature; passing the wire through molten salts, or passing it through a muffle furnace. The annealing of the wire is done to accomplish the following:

1. **change the physical properties as required by controlling the temperature of the lead, molten salts, or of the atmosphere in the muffle.**
2. **char or burn the grease and drawing compounds on the wire.**

✦ ✦ ✦

THE grease, because of its chemical nature,—an organic chemical compound,—on charring, leaves behind a finely divided form of carbon. This carbon is very difficult to remove, and this process of preparation is unsuitable for preparation of wire for electrogalvanizing. This difficulty is overcome, note column 5, Table I, by removing the grease by using an alkaline cleaner. This step will also remove some or all of the drawing compounds on the wire. Proper cooperation of the wire mill with the coating department is necessary to take care easily of such problems.

✦ ✦ ✦

THE wire at anywhere from 1050 to 1300F must be cooled, and it is usually done in air to nearly room temperature, before

***These processes are not common property and therefore patent regulations must be followed.**

it is subjected to the next step. This is called pickling. Because the wire travels through the galvanizing unit continuously at speeds which may be anywhere between 20 and 250 feet per minute, the pickling acid used is hydrochloric acid, fairly concentrated, and it may be hot or cold. This acid does four things:

1. **Removes the scale. (1) The acid attacks underneath the scale, which becomes loose, and is blasted away by the hydrogen produced by the reaction:**
   $Fe + 2HCl \rightleftarrows FeCl_2 + H_2$ (1)
2. **The acid reacts with the lime adhering to the drawn wire**
   $CaO + 2HCl \rightleftarrows CaCl_2 + H_2O$ (2)
3. **removes the burned lubricant**
4. **it etches the wire.**

✦ ✦ ✦

THE preparation of the wire would appear to be complete, but on wiping with a paper towel, the observer may note a black streak on his paper. If there is a red fringe, the scale is loose but has not been removed. There usually is also present a black streak, commonly known as "smut" or smudge. This may be due to:

a) **finely divided carbon produced on charring the organic compounds which are the basis for greases and drawing compounds.**

b) **finely divided carbon which is present in the steel; it is not soluble in the acid, while the iron was dissolved as shown in the equation (1) above.**

✦ ✦ ✦

PROPER control of the pickling step will maintain the amount of smut on the wire at a minimum and possibly even eliminate it altogether. Some electrolytic methods of pickling have been developed to eliminate the smut altogether (2) (3).

✦ ✦ ✦

CHEMICAL analysis of the smut shows it to be a mixture of carbon, perhaps carbide, and iron oxides. The origin of the first has been explained above. The latter, because only FeO is dissolved by acid while Fe_2O_3 and Fe_3O_4 are not, and therefore must fall off or be blasted away by the hydrogen according to the equation (1) shown before. The oxides usually do not form a continuous film, but crack easily and this permits the acid to seep between the cracks and actually dissolve the FeO as follows: $FeO + 2\ HCl \leftrightarrows FeCl_2 + H_2O$ (3). Once this oxide is dissolved the acid can go and proceed on the iron as shown above. The reaction (1) must not proceed too far, because it means a waste of steel and also of acid. The more steel is dissolved the more free finely divided carbon will be left on the surface of the steel. The attack of the acid should be sufficient to lightly etch the surface of the wire. For heavy coatings it is permitted to etch deeper.

✦ ✦ ✦

FOR certain purposes, such as coating by hot dipping, the "smut" can be removed satisfactorily enough by washing the wire with a water spray, preferably hot water. The remaining smut left behind will be taken care of, if not excessive, by the activating step, or even by the molten metal. This last is undesirable, because one favors the formation of dross, which is a waste material to be avoided.

✦ ✦ ✦

THE process outlined in column three is not used for wire, **although it could well be used.** It should be noted that the process is protected by patents. (4) The preparation of the wire would be accomplished with only one operation, namely an oxidizing anneal. The chemistry of the process consists in building up a certain thickness of a controlled oxide. This is obtained by using an appropriately controlled atmosphere. In addition the following is accomplished:

1. **annealing to specifications**
2. **burning off of impurities of organic nature.**

This process is used commercially on wide strip steel.

✦ ✦ ✦

A THIRD method of preparation, used experimentally on strip also protected by patents (5) appears to accomplish essentially the same as the previous method, is outlined in column 4 of table I. Use is made of the property of iron chloride, to be in the vapor phase at relatively low temperatures. The following chemical reactions take place:

$Fe_2O_3 + 6\ HCl \rightleftarrows 2\ FeCl_3 + 3\ H_2O$ (4)
(solid) (gas) (vapor) (vapor)
$FeO + 2\ HCl \rightleftarrows FeCl_2 + H_2O$ (5)

at temperatures between 800 and 1350 F, in which range the iron chlorides are volatile. By means of this process of preparation the following could be accomplished:

1. **anneal of wire to physical specifications**
2. **Elimination of scale**
3. **Elimination of surface impurities**
4. **A chemically clean steel surface which would be not only prepared, but would actually be activated and ready for immediate coating without any further processing provided it did not come in contact with air.**
5. **Iron chloride, as a by product, would be more valuable than the solution of iron chloride obtained when pickling in acid, which is usually dumped.**

✦ ✦ ✦

DISADVANTAGES of such a process:

1. **Difficulties in the handling of gases at the above temperatures since,**
2. **the presence of water vapor makes the hydrochloric acid gas very corrosive,**
3. **making carefully controlled and continuous removal of water vapor necessary.**

✦ ✦ ✦

THE above is an ingenious adaptation of a principle used in various metallurgical industries, such as the chlorine process for the removal of tin from tin plate, (5b) and the process of coating steel with certain metals, such as aluminum, which is deposited from volatile aluminum chloride. (5c)

✦ ✦ ✦

METHOD 4 listed in Table I shows the actual procedure used in the preparation of wire which is to be electroplated by the **Meaker** process of electrogalvanizing wire (6) (7).

✦ ✦ ✦

THE **Tainton** method (8) has been in use for the last half dozen years commercially to prepare wire for electrogalvanizing. This is essentially an electrometallurgical process. The electric current is used to produce the proper reactions. The wire is connected to the negative side of a direct current generator, while the pan holding the salt is connected to the positive side. The medium, or electrolyte, is caustic soda, which is first molten, before passing the current. Sodium metal is given

[1] **All references will be published at the end of Part II.**

off as metal on the wire. This newly produced metallic sodium is very active, making possible the following:

1. **The iron oxide scale is reduced to pure iron, because of the high affinity of native sodium for oxygen**
   $Fe_2O_3 + 6\ Na \rightleftarrows 2Fe + 3Na_2O$ **(6)**
2. **The sodium also reduces other compounds present on the surface of the steel. The result is elemental sulfur and phosphorus.**
3. **All organic substances are burned and lime is removed.**
4. **The wire is annealed to specifications.**

The disadvantages of this method are:

1. **Those inherent to the operation at high temperature**
2. **The molten salt is very corrosive because of its activity**
3. **The maintenance of good electrical contacts with the wire**
4. **Not suitable for wire traveling at high speed**
5. **"Drag out" of fairly large amounts of molten salt. This is not altogether lost because it can be recovered by washing the wire. Note that in the methods listed in columns 3, 4 and 6 of Table I have essentially only 1 and 2 steps, while the other methods require many more to take care of the preparation of the wire. Note also that they may take care of the activation of the wire.**

✦ ✦ ✦

WIRE has also been cleaned and pickled by other anodic and cathodic pickling procedures. The patent literature is full of schemes to do this step and the cleaning successfully. The technical literature is not always explicit of the processes it describes. The cleaning and preparation of wire can be done by mechanical, physical, chemical and electrochemical methods,(2,3) the methods to be adopted depending on the actual coating process to be used.

✦ ✦ ✦

SOME methods may do the removal of grease or scale with a simultaneous deposition of tin,(9) copper(10) and possibly others.

✦ ✦ ✦

THE success of any coating process, be it hot dipping, electroplating, spraying or painting, depends largely on the cleanliness of the material to be coated. To obtain such a condition on wire, the following factors must be taken in consideration, because the preparation of wire must be continuous:

1. **the time must be short**
2. **the results obtained must be uniform**
3. **Eliminate the scale**
4. **Eliminate other impurities on the surface of the wire, such as grease, drawing compounds and lime**
5. **The wire must have the desired physical properties**
6. **For hot galvanizing the wire should be etched. The etching should be a minimum for wire to be electrogalvanized, because surface irregularities show.**

✦ ✦ ✦

THE drawing compounds are difficult to remove at times, because they are spread all over the surface of the wire, and trapped in the pores of the surface. If such is the case for electrogalvanizing, degreasing has to be resorted to as shown in process 4, table I. (see ref. 11).

✦ ✦ ✦

II. Activation

EXPERIENCE has shown that the surface of the steel to be coated, as prepared by some of the methods indicated above, is not suitable for coating:

1. **"Smut" or smudge must be eliminated**
2. **The molten metal, or the electrolyte must readily "wet" the surface of the metal to be coated. This is what is really meant by activation.**

✦ ✦ ✦

THE method of activation depends on the previous preparation and on the subsequent coating processes. If the surface is chemically clean no activation may be necessary.

✦ ✦ ✦

ACTIVATION for surfaces which are to be hot dipped is accomplished by means of a flux. Ammonium chloride, zinc chloride, and a double salt of ammonium zinc chloride in water solution may be used for wire. The concentration of flux used is changed according with the thickness or weight of coating desired. A dilute flux is generally used for light wires and thin coatings. A stronger flux is prepared for heavy wires and heavy coatings.

✦ ✦ ✦

IN Table I, for process I, it is shown that after the pickling the wire is rinsed with water, immediately the same dips into the flux solution. Under certain conditions it may be preferable to use a molten flux instead, which is maintained over the molten metal. A water flux and molten flux is used under certain circumstances, such as when using a blanket on the molten metal, since the same is made up of salts which may behave as a flux, and favors the wetting of the surface by the molten metal. Usually the blanket layer is very thin, and it alone is not sufficient to activate the surface of the steel.

✦ ✦ ✦

AFTER dipping through the flux-water solution, a thin film of this solution adheres to the metal surface. It is desirable to bake this film on the wire. This is accomplished by passing the wire through a furnace kept warm by the burnt gases from maintaining the metal molten in the pan. The purpose of this drying is threefold:

1. **The met wire sputters on coming in contact with the molten metal, a dangerous feature.**
2. **to vaporize the water, heat is taken away from the metal**
3. **On vaporizing the water, an insulating film forms on the wire, while better wetting is desired. The "wetting" is favored by the dry film of flux.**

✦ ✦ ✦

IN process 2, table I, the activation step is one with the preparation, since the blue oxide film would be unsuitable for coating. Because the oxide film was carefully controlled, it can be reduced by using a proper furnace atmosphere. The outside layer on the surface of the steel becomes then a layer of pure iron, in an active state. Since the iron is active it is necessary to introduce the wire into the molten spelter in the next fundamental operation while being surrounded by the reducing atmosphere. If the metal surface to be coated comes in contact with air, no advantage results in the use of this method. This method of using controlled atmosphere has appealed to investigators for many years, and **Cowper Coles**(12) took out a patent in 1910. No successful commercial process was developed until recently(4).

✦ ✦ ✦

IT was mentioned under the Preparation that the hydrochloric acid method produced (process 3, table I) an active surface in only one step. The same principle, that the metal surface should not come in contact with

(*Please turn to Page 314*)

Labor Relations

By Kenneth B. Lewis,

Consulting Wire Mill Engineer,
Worcester, Mass.

An address presented before the Worcester Regional Meeting of the Wire Association, held at the Hotel Bancroft, Worcester, Mass., April 17, 1942. ✦ ✦ ✦ ✦

WHEN I was asked to discuss labor relations at this gathering I knew exactly what was wanted of me. I was nominated to say the unpleasant things that have to be said. In these times, and at such meetings as this, it is a genuine pleasure to discuss and review our efforts in our foreign wars. For the first time in ten long years we find ourselves thoroughly in accord with our Administration in what should be its major objective. Although the circumstance would be unique in our experience, we like to hope and believe that the President knows what he is doing, and is seeking and profiting by competent advice. But there are less pleasant subjects which we cannot ignore.

✦ ✦ ✦

IN the Roman Catholic Church, one hundred years after the death of a clergyman or layman of distinguished piety and unselfish service to humanity, an ecclesiastical court may be convened to consider his canonization. The session is merely a formality, the outcome being certain, but the outward forms are preserved, and the candidate's virtues are duly set forth and proven by ardent advocates. There is another functionary active in the proceedings, whose ungrateful task it is to oppose the application by pointing out that the miracles were not judicially attested, the benefactions possibly tinged with self-interest, and that during those long periods during which the candidate's life was not subject to public scrutiny there might have been conduct unworthy of a saint. This unfortunate and unwilling appointee is known as **"The Devil's Advocate."** This is the role I am filling tonight.

I CAN sum up labor relations in two words. They stink. They will go on stinking as long as that vicious piece of legislation **The Wagner Act** remains on the books, is administered by the **New Dealers,** and interpreted by this puppet courts. **Mr. Roosevelt's** attitude toward the **Wagner Act** is that of a mother and her half-witted child. He will not hear a single word against it. Mr. Roosevelt is concerned about a suitable name for this war. I suggest the **"War of the Wagner Act."** He complains that we do not have enough parades. I direct his attention to the parades of the pickets before the gates of our strike-bound munitions plants. He wants more bands. I offer him the bands of thugs, who, with his implicit blessing, harry and maim our independent workmen. He calls for more active participation of the citizen in his government. I commend to his attention the great outpouring of letters to congressmen begging for legislation to relieve us of union tyranny.

KENNETH B. LEWIS

Born Bridgewater, Mass., and educated public schools, Quincy, Mass. A.B. Harvard University. From 1904 to 1907 with Bethlehem Steel Company, becoming Asst. Supt. of open-hearth furnace. From 1907-1909 with the American Steel & Wire Company, Worcester, experimental work on wire. From 1909-1932, Morgan Construction Company, building wire mill equipment. In 1932 established own practice as Consulting Engineer in which occupation he is now engaged.

✦ ✦ ✦

THE **President** has, in fact, taken cognizance of this avalanche of letters and he doesn't like them. He feels that while laws are useful to curb corporations, labor unions should be conquered by kindness. He asks that we trust to his influence and to the patriotism and good sense of the unions. For God's sake what kind of people does he think we are? And for that matter, what kind of people are we, that we listen to that sort of ranikaboo without a reply? I saw a little verse the other day that made me stop and think.

How happy is the moron!
He doesn't give a damn.
I wish I were a moron,
By God, perhaps I am!

✦ ✦ ✦

MR. ROOSEVELT'S surprise at our reluctance to leave labor matters in his hands carries me back to a melodrama that used to go 'round the 10-20-30 circuit when I was young. It was called **"Nellie, The Beautiful Cloak Model."** Much of the plot has escaped me, but one line I shall never forget. In the first act Nellie was annoyed by the attentions of a villain in a full dress suit and shiny silk hat. She spurned him. He chloroformed

Nellie and tied her to the railroad track, and it would have gone hard with our Nell had not the hero galloped up, on a pair of cocoanut shells, just as the headlight came 'round the bend. In the second act he again persecuted the lovely girl with his addresses, and got another good spurning. This time he lured her to the old saw-mill, tied her to the carriage, threw in the clutch, and stepped out into the night. At the last possible moment the belt flew off the main pulley. In the third act he solicited her attendance at a private showing of his etchings, and when she declined with horror he spoke the line that will live forever in my memory. "Nellie," he said, "why do you fear me?"

✦ ✦ ✦

IN our civil war against the **New Deal** we must not kid ourselves into the belief that we are getting anywhere. We are just slowly backing down **Bataan** peninsula, maintaining a good rear-guard action and a bit of guerrilla fighting. It is a melancholy parallel in view of recent events on **Bataan.** There is, however, a more cheerful parallel. You will recall that **Gen. MacArthur's** chief opponent, chagrined at his failure to make better headway with vastly superior forces, locked himself into his room, stripped off his insignia, and—well, no, let us not pursue the matter. It is mere wishful thinking.

✦ ✦ ✦

BUT I have certain definite suggestions to lay down before you. Like our **President,** I want to hear more shouting, more noise, more enthusiasm, but I want to hear it from you. What's the matter with us? Are we punch-drunk? Never a day passes without recording a dozen acts, opinions, rulings, and miscellaneous rascalities, any one of which, in the old days would have brought out a scream of rage from the entire industrial world. Now we just shrug our shoulders. Do you know how many paid writers and speakers, paid with your money, are pouring out **New Deal** propaganda? Thirty four thousand professionals, and God alone knows how many volunteers. They are clever people, too, in their line. The doctrine of compensation acts in their behalf. Seeing them unable to accomplish anything of a practical nature, God has given them glib tongues and facile pens, and they are damnably plausible. Are we too old, too stubborn, or too dumb, to learn to fight with their weapons? I don't believe it.

✦ ✦ ✦

ALL the sound arguments are on our side; are we too proud to fight? I don't think you realize how easy it is. In the first place we don't have to tackle our own employees; it would be a waste of time, and moreover might land us in jail. It's the neutrals we should go after. You meet them everywhere, they are the professional classes, doctors, lawyers, teachers, preachers, entertainers, small business people who have no real contact with labor problems. You run into them at church affairs, school affairs, lodge affairs, golf, bridge, and so on. All they know is what they see in the papers, and you'd be surprised how easy you can knock them off if you just get past the stock phrases and catchwords which make up their entire repertory.

✦ ✦ ✦

I HAVE been working on these people a long time, and I've never lost a case. Here's the technique. Let them start, and go along alone for a while. Just make sympathetic noises and look interested but dumb. As their confidence increases they will begin to use some of the resounding but meaningless clichés that make up the New Deal case. Stop them, apologetically, and ask them what such and such an expression means. Actually it has no meaning. They will try to explain it by uttering another meaningless phrase. Ask them what that one means, Understand, you are polite, you are humble, you are seeking enlightenment. Be nice, but keep politely boring in, and don't let them slip away and change the current of the argument. If you are careful, you'll soon have them panting with eagerness to get rid of the whole subject. I've had them almost in tears. You just keep them on their heels so they can't get set. When you get them well flustered, open up your own side of the case. Be emphatic, bellow a bit, curse a little, don't let yourself be interrupted — talk them right down. They'll be too slap-happy to say much. Then apologize for your vehemence, say that the subject is one of such vital importance that you can't restrain yourself when you see how frightfully it is misunderstood. At the very worst, you have suppressed a bore; at best, you have started a conversion. At any rate that bird won't risk a **New Deal** cliché in your presence again.

✦ ✦ ✦

YOU know pretty well in advance what incidents will provoke these arguments. Look over newspapers for horror stories aimed at discrediting employers and capitalists. You know very well they are pure bunk, but I seriously beg that you take pains to familiarize yourself with each case. Think it over, marshall your arguments just as though you expected to be called on to discuss it in public. Have each case ready, and then just sit around and wait for one of these dim-wits to take the bait. When I say dim-wits, I just refer to their habit of pre-judging matters that are out of their field. We technical and industrial folks have got the reputation of never hitting back, so that any little professional pip-squeak thinks he can push us around. It's time we got tough.

✦ ✦ ✦

SOMEBODY is sure to bring up the reluctance of employers to submit their cases to arbitration, and point out that their cases must be pretty weak. Tell them how arbitration works these days. The employer names one member of the board, the union names one, and the **President** names a third, to represent the public. The **President's** nominee turns out to be **John R. Tinsmith,** late business agent of the pretzel bender's union, who has, however, resigned his post and divested himself of all labor affiliations so that he may approach his duties free from bias. The union is holding his job open.

✦ ✦ ✦

OR, if Mr. Tinsmith, that veteran arbitrator, is busy on another case, the President secures the services of **Prof. Kinknoodle,** head

of the economics department of **Pip-squeak University.** The Professor is eminently qualified for the job, having made an exhaustive study of labor relations in the **Soviet Union,** and written a book called **"The Collapse of Capitalism."**

✦ ✦ ✦

WHEN the award is finally made it is buried among the death notices. Nobody waits for it. After Notre Dame has rolled up 78 points on St. Lawrence in the first quarter, who waits for the snake dance and the assault on the goal posts?

✦ ✦ ✦

TELL them the story of the baseball game between Heaven and Hell, that never came off. St. Peter and the Devil met on their day off, and hoisted a couple. "Satan, old boy," said Peter, "we ought to see more of each other. Why don't you scratch up a baseball team and we'll play you a series for the championship of whereever it is that we're at."

✦ ✦ ✦

"NO," said the Devil, "I won't do it. It wouldn't be fair. You wouldn't have a chance."

✦ ✦ ✦

"WHAT do you mean?" said Peter. "Look at the team I could get together! **Rube Waddell** and **Christy Mathewson** in the box, **Marty Bergen** behind the bat, **Lou Gehrig** on first, **Bobby Lowe** and **Herman Long** around the keystone, **Eddie Grant** on third, and I can pick three complete outfields that never hit under .350 in their lives!"

✦ ✦ ✦

"PETE, said the Devil, "you'd never get a man on first base. I admit you've got practically all the ball players, but remember, old boy, I've got the umpires!"

✦ ✦ ✦

ANOTHER common method of attack among the neutrals is to talk about these rumored profits of hundreds of percent on war contracts. Once they start talking about profits, lick your lips, but look innocent. Get these neutrals tangled up in figures and they're helpless as flies in Tanglefoot. They'll probably open up on this **Jacks** and **Heintz** case, out in Cleveland. They'll mention some fantastic profit, say 1400 percent. You pipe up quietly and ask whether that was the annual return on capital, or the profit on a contract. They don't know, but suppose it was on a contract. Was it figured on the cost of the job, or on the selling price? They don't know, probably the cost. Was that before or after taxes. They don't know. Did it provide for depreciation at the usual figure? They don't know. Was there any allowance for amortization of special war tools, suitable for no other work? They don't know.

✦ ✦ ✦

AFTER one of these birds has said "I don't know" a certain number of times he gets a touch of the inferiority jitters. He's pretty well softened up. Bring up your artillery. Does he know how old this concern is? No. Doesn't he know that it was organized in 1940, and inside six months it had war contracts to a value ten times its capital? How the Hell do such things happen? (You're gradually warming up). Who gives big contracts to these unknown fly-by-nights when the country is full of old respectable firms that have filled out fifty questionnaires and can't even see the fourth assistant secretary of commerce? You've written to your Congressman and you want an investigation. Who the Hell is throwing your good money around like that?

✦ ✦ ✦

HERE you find you've been bellowing like a moose and pounding on the table. You apologize. Your chastened friend has just enough fight left to ask whether you don't think 6% is enough profit on war work. Tell him any manufacturer would consider that a sure 6% was a gift from heaven. Tell him you have stock in 30 big corporations and not a damned one of them can hold a dividend rate of 6%. Now, if you want to push his face right down in the mud, ask him if he thinks the 6% ought to be figured before or after taxes. Of course he'll say "before taxes." Ask him if he knows what the corporation profits tax is. He doesn't know. Tell him it's 18%. By the way, never hesitate for a fact or a figure. Pick one out of the air, and **make it good.** Don't be scrupulous; remember what they're doing to us. Now ask your friend how he figures a manufacturer can take a 6% profit, and then pay an 18% tax out of it. Ask him if that doesn't figure out a 12% loss on every job? Eight jobs like that and his capital has vanished! Of course this argument is full of fallacies, but he's too groggy to notice. Give him the old one-two and let them carry him out. Remember he's got a horse-shoe in his glove.

✦ ✦ ✦

SOME day one of these amateurs will bring up the **Reuther Plan.** This plan, they will say, would have converted our big auto plants for the production of planes at the rate of 500 a day, but because it was suggested by a union man the employers simply ignored it. Now you've got them! Be meek, be polite, ask them just what was the **Reuther Plan?** Why it was a plan to make 500 planes a day in the auto plants. Yes, I know, but just how? The auto plants have had a heck of a time converting; and it doesn't seem logical that they should have turned down a simple plan that would produce at least three times what we can do now. Well, they'll say, that was just the bull-headed stubbornness of the average manufacturer.

✦ ✦ ✦

"WELL," you ask, "just how did the plan operate?" They don't know. Well, get ready to go to town. "Didn't you know that Reuther really never had any plan? Didn't you know that the employers got him into a meeting at once and asked him to explain the plan, and he couldn't? Didn't you know that he demanded that the unions be given a share in management, and that then and then only would they work out the plan?"

✦ ✦ ✦

TELL them the story of the noiseless lawn-mower. **Andrew Campbell,** late consulting engineer, had a call one day from a young lady, who asked him whether he assisted people in developing patentable ideas. He said he did. She said, rather self-conscious, and with some giggling, that she had an in-

(*Please turn to Page 312*)

Hot Dip Tinning of Carbon Steels As Affected By Variation of Carbon, Phosphorous, Copper, Silicon, Manganese, Aluminum and Titanium

By Morris E. Fine[1] and Ralph L. Dowdell[2]

(Published in Three Parts)

PART II

This part covers the testing of the tinned specimens and discussion of the results of these tests, including (1.) Appearance of the Specimens after Tinning, (2.) Metallographic Examination of Tin and the Iron-Tin Compound Layer. ✦ ✦ ✦ ✦

IV. Testing of the Tinned Specimens, and Discussion of the Results of These Tests

1. Appearance of the Specimens After Tinning

THE specimens after tinning were bright and shiny. No differences in the color or shade of the tin could be noticed; however, in examining the specimens under a low power microscope pits or irregularities were found in the tin coating. It was noticed that the number and size of these pits varied from specimen to specimen and also from place to place on the same specimen. These pits were much too numerous to actually count with a microscope; therefore, all the surfaces were examined and the specimens were grouped into five groups based roughly upon the number and size of these pits. Those in group 1 had the least pits while those in group 5 had the most.

✦ ✦ ✦

FIGURES 3, 4, 5, and 6 are photomicrographs of some of these pits at a magnification of 40 times. Figures 3 and 4 show areas where the pits are quite large and quite numerous. Figure 5 shows an area where a large number of small pits can be seen. Figure 6 shows some of these pits on some high grade commercial tin-plate. The commercial tin plate undergoes a polishing operation, and some of the pits are without a doubt smeared over. These pits are not necessarily discontinuities in the tin coating or (pin-holes). The black spots on the photomicrographs change size with change of focus. This proves they are pits and not a second phase. The group number of each specimen is given in Table VI on the following pages. The group numbers for the four samples sawed from each billet were averaged to give a rating for that composition. The specimens in each set were examined at random, but the sets were kept separate. It was extremely difficult to group these specimens because the size and number of these pits varied from place to place on the same specimen. All correlations were based upon this average value.

✦ ✦ ✦

FROM the data given in Table VI correlation between composition and the size and number of these pits, thus the smoothness of the coating, was found only for variations in silicon. Of the individual heats (Table VI B) the silicon killed steels have a poorer rating. In an aluminum killed heat (Table VI H - Heat #3626) as the silicon increased from 0.015 to 0.508 per cent the number and size of pits increased (average rating increased from 2½ to 3½). In a

1. Research Fellow. Abstract of thesis presented in partial fulfillment of requirements for the M.S. degree, University of Minnesota, 1942.

2. Professor of Metallography, University of Minnesota.

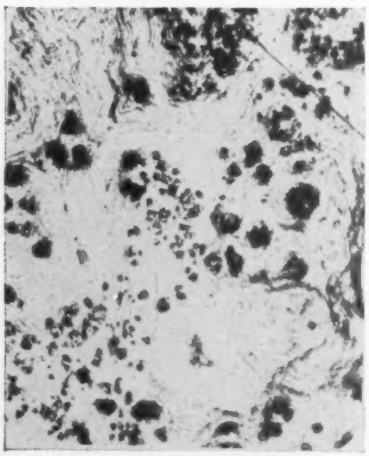


Figure 3. Large Pits in Tinned Specimen. ✦

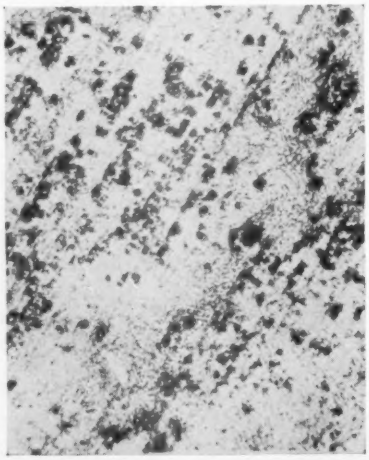


Figure 4. Slightly Smaller Pits in Tinned Specimens. ✦ ✦ ✦ ✦

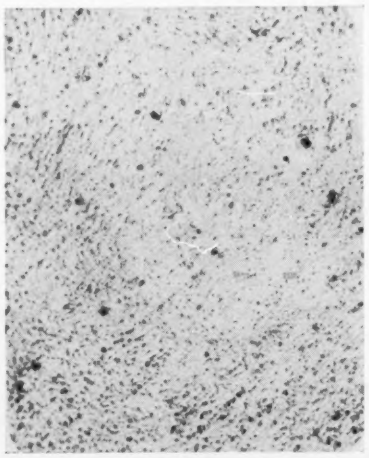


Figure 5. Large Number of Fine Pits. ✦

silicon killed heat (Table VI F - Heat #2913) the number and size of pits increased from an average group rating of 3.25 to 4.00 as the silicon increased from 0.127 per cent to 0.625 per cent. In a silicon killed rephosphorized heat (Table VI C - Heat #1029) the number and size of pits remained at the poor rating of 4.75 as the silicon increased from 0.200 per cent to 0.500 per cent. In two aluminum killed heats in which phosphorus, copper and silicon were varied together (Table VI D and G - Heats #1071 and 2959) the correlation is not so evident. The increase in copper and phosphorus appear to offset the influence of silicon somewhat.

✦ ✦ ✦

THUS the data presented indicates that in general, and other things being equal, as the silicon increases the size and number of these pits and the roughness of the tin coating increase slightly. No such correlation was found for any other element that was varied.

✦ ✦ ✦

TWO of the rimming heats were as good as the aluminum killed heats, but in general the aluminum killed steels had smoother coatings than either the silicon killed or rimming steels.

✦ ✦ ✦

2. Metallographic Examination of Tin and the Iron-Tin Compound Layer.

THE tin coating on steel consists of two layers. On the outside is a layer of tin, and between the tin and steel is a layer in which the iron and tin have alloyed. **Ehret and Westgren**[8] in studying the iron-tin system by x-ray analysis found no difference in the diffraction pattern of pure tin and the tin phase found in iron-tin alloys. This proves that iron and other phases are insoluble in tin, and this outer layer must be pure tin. **Edwards and Preece**[9] and also **Ehret and Westgren**[8] claimed the presence of an iron-tin intermetallic compound stable at room temperatures and corresponding to the composition $FeSn_2$. From this fact and from the constitution diagram of the iron-tin system given below in Fig. 7 it can be concluded that the layer in which the iron and tin have alloyed is most likely this compound $FeSn_2$. ✦ ✦ ✦

Table VI — Grouping of Specimens According to the Number and Size of Pits in the Tin Coating on Steel of Each Composition *

A	Rimming Heats					
Heat No.	Set 1	Set 2	Set 3	Set 4	Ave.	Carbon Content
1917	2	3	3	2	2.5	.05c
1889	5	4	4	3	4	.07c
2283	5	4	3	4	4	.08c
2311	3	3	2	4	3	.08c
2774	4	4	4	4	4	.04c

B	Individual Heats of Different Practice					
Heat No.	Set 1	Set 2	Set 3	Set 4	Ave.	Kind of Steel
1082	5	5	5	4	4.75	Silicon killed rephosphorized
1083	5	5	5	5	5	Silicon killed
1833	5	4	4	4	4.25	Silicon killed resulfurized
2821	4	3	4	3	3.50	Al killed rephosphorized

Heat No.	C	P	S	Mn	Cu	Si
1082	.10	.077	.027	.44	.302	.292
1083	.10	.010	.020	.43	.216	.270
1833	.19	.018	.075	.90	.200	.121
2821	.10	.057	.028	.39	.387	.005

* The specimens were divided into five groups according to the size and number of these pits. Group 1 is the best, and group 5 the worst.

8. All references will be published at the end of Part III.

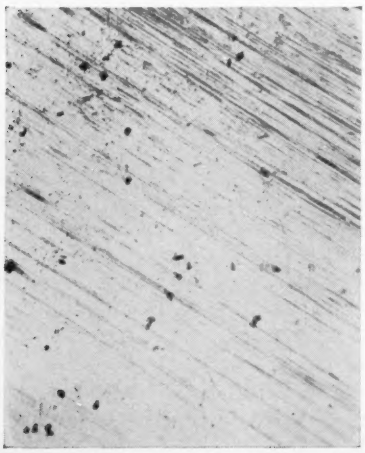


Figure 6. Pits in Commercial Tin Plate. ✦

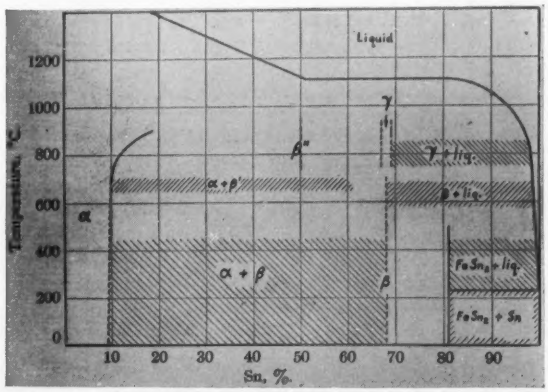


Figure 7. Schematic Phase Diagram of the System Fe-Sn—Ehret and Westgren. ✦ ✦ ✦ ✦ ✦ ✦

C Silicon Killed — Rephosphorized Steel with Varying Silicon, Heat #1029

Base Composition	C	P	S	Mn	Cu	Si
1029	.10	.099	.035	.39	.292	.200

Heat No.	Set 1	Set 2	Set 3	Set 4	Ave.	Analysis Si
1029	5	5	5	4	4.75	0.200%
1029 x	4	5	5	5	4.75	0.500

D Aluminum Killed Steel with Variation in Phosphorus, Silicon, and Copper, Heat #1070

Base Composition	C	P	S	Mn	Cu	Si
#12	.10	.011	.024	.44	.310	.0094

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Chemical Composition Si	P	Cu
12	2	3	4	2	2.75	.0094		
1	3	3	3	3	3.00	.214		
12	2	3	4	2	2.75		.011	
14	3	3	3	3	3.00		.067	
4	2	2	3	3	2.50		.087	
12	2	3	4	2	2.75			.310
7	2	2	3	2	2.25			.622
5	2	2	3	3	2.50			.652
12	2	3	4	2	2.75	.0094	.011	.310
6	3	2	2	3	2.50	.173	.011	.590
9	3	2	2	3	2.50	.181	.011	.503
13	3	3	3	3	3.00	.187	.079	.310
10	3	2	2	2	2.25	.0094	.066	.484
11	3	2	2	2	2.25	.0094	.079	.759
8	3	2	3	2	2.50	.196	.067	.452

E Aluminum-Silicon Killed Steel with Variation in Carbon, Aluminum, and Titanium—Heat #2178

Base Composition	C	P	S	Mn	Cu	Si	Al	Ti
#8	.05	.011	.026	.45	.229	.120	Trace	.000

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Analysis C	Al	Ti
8	4	3	3	3	3.25	.05		
1	2	2	3	2	2.25	.20		
2	2	2	2	3	2.25	.35		
8	4	3	3	3	3.25		Trace	
6	4	2	2	2	2.50		.145	
7	3	3	2	2	2.50		.303	
8	4	3	3	3	3.25			.000
3	5	4	3	4	4.00			.042
4	3	3	4	4	3.50			.100
5	3	3	3	2	2.75			.169

F Silicon Killed Steel with Variation in Phosphorus, Manganese, Copper, and Silicon — Heat #2913

Base Composition	C	P	S	Mn	Cu	Si
#10	.32	.017	.027	.50	.191	.127

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Chemical Composition P	Mn	Cu	Si
10	3	3	4	3	3.25	.017	.50	.191	.127
8	2	4	4	4	3.50	.040			
9	2	3	4	3	3.00	.080			

(Continuation of Table VI-F on Following Page)

IN order to examine these layers, a square section 5/8 inch x 5/8 inch was cut from the corner of each specimen in one set as indicated in Fig. 8, which shows the position of that corner. The section was then mounted between two pieces of steel held together tightly by two bolts, one on each side of the specimen. The section normal to the plane of the photograph indicated by the arrow on Fig. 8 was polished for micro-examination.

✦ ✦ ✦

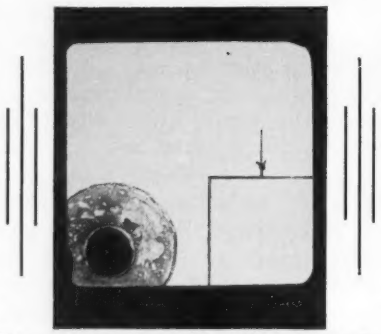


Figure 8. Section cut from each specimen for microscopic examination indicated by black lines—Arrow indicates surface polished. ✦ ✦

IN preparing the specimens for microscopic examination, they were first ground flat on number 2 emery paper and then with 320 mesh carborundum paper, both vertical lap (1225 R.P.M.). After hand grinding on 00 metallographic paper, they were given a preliminary polish on a vertical paraffin wheel impregnated with 600 mesh carborundum (600 R.P.M.). The specimens were then etched for one minute in a saturated solution of picric acid in alcohol and polished again on the paraffin wheel. The final polish was with rouge on a very short-nap, well-worn, wool cloth on a horizontal wheel revolving at 1100 R.P.M.

✦ ✦ ✦

AFTER the final polish a double etch was necessary to show both sides of the iron-tin alloy layer. The first etch was one minute, without agitation, in a mixture of one drop of concentrated nitric acid and two drops of hydrofluoric acid in 25 milliliters of glycerine. The second etch was for ten seconds in a saturated solution of picric acid in alcohol. Most of the specimens had to be repolished several times before well defined tin and iron-tin alloy layers

were achieved. During grinding and polishing the specimens were rotated to minimize the flow.

✦ ✦ ✦

THE polishing procedure described above is a variation of that suggested by **Romig and Rowland.**[10]

✦ ✦ ✦

FIGURE 9 is a photomicrograph of Specimen 2178-7 showing the steel, tin, and iron-tin compound magnified 1000 times.

✦ ✦ ✦

IN Fig. 9 the tin layer varies from 0.0006 to 0.0007 inch while the iron tin compound layer varies from 0.00004 to 0.00012 inch. The ferrite grains are clearly indicated.

✦ ✦ ✦

NO differences in the appearance of the tin layer were noticed in any of the specimens. No measurement was made of its thickness because of the large variation in thickness from place to place on the same specimen and because of flow of the tin during polishing.

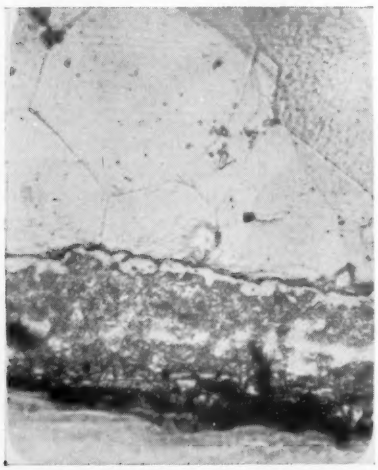


Figure 9. Photomicrograph of Specimen 2178-7 Showing the Tin and Iron-Tin Compound Layers with Ferrite Base. Mag. 1000 diameters. Etched 5 seconds in saturated solution of picric and 1 min. in 25 ml. glycerine, 1 drop HNO_3 and 2 drops HF.

✦ ✦ ✦

SOME differences between specimens as to the thickness of the alloy layer, however, were noticed. The thickness of this layer was measured with a microscope by shining the image on the ground glass of the camera attachment. The bellows was adjusted to a magnification of 2000 diameters. The thickness was then measured on the ground glass with dividers and a scale graduated to 0.02 inch.

Table VI-F (Continued from Preceding Page)

Base Composition 10	C .32	P .017	S .027	Mn .50	Cu .191	Si .127

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Chemical Composition P	Mn	Cu	Si
6	3	2	2	3	2.50		.69		
7	3	3	4	3	3.25		.89		
3	2	3	4	4	3.25				.248
4	3	4	4	3	3.50				.357
5	5	4	3	4	4.00				.625
1	3	3	3	3	3.00			.358	
2	3	4	4	4	3.75			.600	

G Aluminum Killed Steel with Variation in Copper, Phosphorus, and Silicon — Heat #2959

Base Composition #12	C .11	P .015	S .128	Mn .42	Cu .175	Si .0090

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Chemical Composition P	Cu	Si
12	2	2	3	3	2.50	.015		
10	2	2	3	3	2.50	.033		
1	2	3	3	3	2.75	.070		
12	2	2	3	3	2.50		.175	
2	2	3	2	2	2.25		.289	
3	2	2	2	3	2.25		.470	
12	2	2	3	3	2.50			.009
4	2	3	3	3	2.75			.412
12	2	2	3	3	2.50	.015	.175	.009
5	3	4	4	3	3.50	.015	.400	.436
7	3	3	3	3	3.00	.086	.175	.570
8	5	3	4	2	3.50	.060	.470	.009
9	5	3	4	3	3.75	.080	.377	.568
11	5	4	2	3	3.50	.070	.475	.560

H Aluminum Killed Steel with Variation in Phosphorus, Manganese, Copper, and Silicon — Heat #3626

Base Composition #10	C .17	P .019	S .032	Mn .48	Cu .235	Si .015

Spec No.	Set 1	Set 2	Set 3	Set 4	Ave.	Chemical Composition P	Mn	Cu	Si
10	2	2	3	3	2.50	.019	.48	.235	.015
1	2	3	3	2	2.50			.388	
2	2	3	3	2	2.50			.676	
3	3	3	3	3	3.00				.132
4	3	3	4	3	3.25				.249
5	4	3	4	3	3.50				.508
6	3	3	3	4	3.25		.73		
7	2	2	2	3	2.25		.85		
8	2	2	3	3	2.50	.045			
9	3	2	2	2	2.25	.084			

Table VII — Thickness of Alloy Layer for a Specimen of Each Composition

A Rimming Steels

Spec No.	Thickness Range 1/10,000 of an inch	Chemical Composition
1917	0.75 - 2.8	.05C
1889	0.80 - 1.7	.07C
2283	1.0 - 2.0	.08C
2311	1.3 - 2.9	.08C
2774	0.8 - 1.1	.04C

B Individual Heats of Different Practice

Spec No.	Thickness Range in 1/10,000 of an inch	C	P	S	Mn	Cu	Si
1082	0.9 - 1.5	.10	.077	.027	.44	.302	.292
1083	1.5 - 2.3	.10	.010	.020	.43	.216	.270
1833	0.6 - 1.1	.19	.018	.075	.90	.200	.121
2821	0.8 - 1.4	.10	.057	.028	.39	.387	.005

1082 is silicon killed rephosphorized, 1083 is silicon killed, 1833 is silicon killed resulfurized, and 2821 is Al killed.

C Silicon Killed Rephosphorized Steel with Varying Silicon — Heat #1029

Base	Composition	C	P	S	Mn	Cu	Si
	#1	.10	.099	.035	.39	.292	.200

Spec No.	Thickness Range 1/10,000 of an inch	Chemical Composition
1	1.3 - 2.4	0.200 Si
2	1.5 - 2.4	0.500 Si

D Aluminum Killed Steel with Variation in Silicon, Phosphorus, and Copper — Heat #1071

Base	Composition	C	P	S	Mn	Cu	Si
	#12	.10	.011	.024	.44	.310	.0094

Spec No.	Thickness Range Ten Thousandths of an inch	Chemical Composition Si	P	Cu
12	1.1 - 2.0	.0094		
1	1.8 - 2.7	.214		
12	1.1 - 2.0		.011	
14	0.6 - 1.4		.067	
4	0.7 - 2.0		.087	
12	1.1 - 2.0			.310
7	0.7 - 2.0			.622
5	0.5 - 1.8			.652
12	1.1 - 2.0	.0094	.011	.310
6	0.9 - 1.6	.173	.011	.590
9	0.5 - 2.0	.181	.011	.503
13	1.1 - 2.0	.187	.079	.310
10	1.1 - 2.0	.0094	.066	.484
11	1.0 - 2.2	.0094	.079	.759
8	0.7 - 1.4	.196	.067	.452

E Aluminum-Silicon Killed Steel with Variation in Carbon, Aluminum, and Titanium — Heat #2178

Base	Composition	C	P	S	Mn	Cu	Si	Al	Ti
	#8	.05	.011	.026	.45	.229	.120	Trace	.000

Spec No.	Thickness Range Ten Thousandths of an inch	Chemical Composition C	Al	Ti
8	1.0 - 2.0	.05		
1	1.0 - 1.6	.20		
2	1.0 - 1.6	.35		
8	1.0 - 2.0		Trace	
6	1.0 - 1.6		.145	
7	0.4 - 1.2		.303	
8	1.0 - 2.0			.000
3	1.0 - 2.2			.042
4	0.5 - 0.8			.100
5	0.5 - 0.8			.169

From the known magnification this was then converted to the actual thickness. Two measurements were made on each specimen, one of the minimum thickness, and one of the maximum thickness observed. These are given in Table VII on the accompanying pages.

✦ ✦ ✦

IN most specimens these thicknesses were obtained by choosing a typical field and measuring the minimum and maximum thickness in this field. This was found to hold for any other field on the section polished. In certain specimens, islands of compound were found in the tin layer. These would not polish out, and therefore, were not due to flow from polishing. Places were also noticed where peninsulas of compound about 1 ten thousandth of an inch wide jutted into the steel for a distance of 2 or 3 thousandths of an inch. These places were probably pits in the steel before tinning. Tin was found in the center of a few of the thicker peninsulas.

✦ ✦ ✦

THE thickness of this alloy layer was found to vary from 0.00004 to 0.00029 inch. The difference between the minimum and maximum thickness of the alloy layer on the same specimen, however, was about 0.0001 inch on most of the specimens. The thickness of this alloy layer was the same at the edge of the billet as at the center of the billet.

✦ ✦ ✦

FROM the data presented in Table VII increase in silicon and manganese appear to increase the thickness of this alloy or compound layer. No correlation with composition was found in the rimming heats. Their thicknesses covered almost completely the range stated. Also no correlation was obtained from the individual heats. In a silicon killed rephosphorized heat (Table VII C - Heat #1029) as the silicon increased from 0.200 per cent to 0.500 per cent the thickness range increased from 0.00013 - 0.00024 to 0.00015 - 0.00028 inch. In a silicon killed steel heat series (Table VII F - Heat #2913) as the silicon increased from 0.127 to 0.625 per cent the thickness range increased from 0.00005 - 0.00012 to 0.00012 -

0.00022, and as the manganese increased from 0.50 to 0.89 per cent the thickness increased from 0.00005 - 0.00012 to 0.00014 - 0.00021. In this same series phosphorus and copper variation had no effect. In an aluminum killed steel heat series (Table VII G - Heat #3626) as the silicon increased from 0.015 to 0.508 the thickness range increased from 0.00004 - 0.00012 to 0.00010 - 0.00021, and as the manganese increased from 0.48 to 0.85 per cent the thickness range increased from 0.00004 - 0.00012 to 0.00007 - 0.00020. Again in this same series the phosphorus and copper had no effect.

✦ ✦ ✦

IN an aluminum - silicon killed series in which carbon, aluminum and titanium were varied (Table VII E - Heat #2178) as the titanium varied from 0 to 0.169 per cent the thickness range decreased from 0.00010 - 0.00020 to 0.00005 - 0.00008, while variation in carbon and aluminum had no effect. Titanium was not varied in another series, so there was no way of checking this correlation.

✦ ✦ ✦

IN the series made from heat #1071, an aluminum killed steel (Table VII D), silicon, phosphorus, and copper were varied independently and then together. In the base sample with 0.0094 per cent silicon the thickness range is 0.00011 - 0.00020 while in the sample with 0.214 per cent silicon, all other elements constant, the thickness range is 0.00018 - 0.00027. As the phosphorus alone was increased the thickness range decreased slightly. When two of the elements or all three were varied the thickness range remained the same or decreased slightly. In a similar series made from heat #2959 also an aluminum killed steel but lower in residual copper, the thickness range increases with increase in silicon alone but variation in two or three of the elements (copper, phosphorus, and silicon) increases in the thickness range. This is exactly contrary to the previous series.

✦ ✦ ✦

FROM these data the only sure conclusion that can be drawn is that other conditions being equal

(*Please turn to Page 320*)

F Silicon Killed Steel with Variation in Phosphorus, Manganese, Copper, and Silicon — Heat #2913

Base	Composition	C	P	S	Mn	Cu	Si
	#10	.32	.017	.027	.50	.191	.127

Spec No.	Thickness Range Ten Thousandths of an inch	Chemical Composition P	Mn	Cu	Si
10	0.5 - 1.2	.017			
8	0.7 - 1.5	.040			
9	0.6 - 1.8	.080			
10	0.5 - 1.2		.50		
6	0.7 - 2.0		.69		
7	1.4 - 2.1		.89		
10	0.5 - 1.2				.127
3	1.4 - 1.8				.248
4	1.0 - 2.0				.357
5	1.7 - 2.2				.625
10	0.5 - 1.2			.191	
1	0.6 - 1.5			.358	
2	0.6 - 1.5			.600	

G Aluminum Killed Steel with Variations in Phosphorus, Manganese, Copper, and Silicon — Heat #3626

Base	Composition	C	P	S	Mn	Cu	Si
	#10	.17	.019	.032	.48	.235	.015

Spec No.	Thickness Range Ten Thousandths of an inch	Chemical Composition P	Mn	Cu	Si
10	0.4 - 1.2			.235	
1	1.5 - 2.3			.388	
2	0.7 - 1.0			.676	
10	0.4 - 1.2				.015
3	0.6 - 1.6				.132
4	0.7 - 1.8				.249
5	1.0 - 2.1				.508
10	0.4 - 1.2		.48		
6	1.2 - 2.1		.73		
7	0.7 - 2.0		.85		
10	0.4 - 1.2	.019			
8	0.7 - 1.8	.045			
9	0.6 - 1.2	.084			

H Aluminum Killed Steel with Variation in Copper, Phosphorus, and Silicon — Heat #2959

Base	Composition	C	P	S	Mn	Cu	Si
	#12	.11	.015	.028	.42	.175	.0090

Spec No.	Thickness Range Ten Thousandths of an inch	Chemical Composition P	Cu	Si
12	0.6 - 1.8	.015		
10	0.7 - 1.7	.033		
1	0.8 - 1.5	.070		
12	0.6 - 1.8		.175	
2	1.0 - 1.4		.289	
3	1.0 - 2.4		.470	
12	0.6 - 1.8			.009
4	1.0 - 2.4			.412
12	0.6 - 1.8	.015	.175	.009
5	2.1 - 2.8	.015	.400	.436
7	2.1 - 2.8	.086	.175	.570
8	1.2 - 2.1	.060	.470	.009
9	1.0 - 2.0	.080	.377	.568
11	2.2 - 2.8	.070	.475	.560

Training of Labour

By K. Bernard Wise,
West Wickham, Kent, England

Because of war conditions in Great Britain many thousands of laborers hitherto inexperienced in factory routine have been employed with the result that special consideration has been found necessary to the problems of training. ✦ ✦

LABOUR welfare is a subject which has been discussed in almost every trade journal and it is now generally appreciated that the application of the findings of psychological research cannot but result in repayment to the employer in the form of greatly improved efficiency and greatly lowered production costs.

✦ ✦ ✦

THERE can be no denial of the claim that in whatever type of manufacturing organization and whatever are the abilities or experience of new personnel, some period of initial training is essential if losses which are directly attributable to inefficiency and inexperience are not subsequently to become apparent. The more intensive and the more comprehensive is the initial training the greater will be the ultimate return to the employer.

✦ ✦ ✦

ALTHOUGH the actual form of training entered into will mainly be of specific nature to determine the possibilities of active employment in, perhaps, one or two operations, some general instruction in the functioning of the completed factory product is essential. Unless this is done the individual operative may be tempted to regard his own work as being of minimum importance when compared with the final output, whereas, on appreciation of the functional value of the product as a whole, interestedness is created. It is impracticable to give, in an article of this length, any detailed advice as to the length and intensity of the instructional programme, as both factors will be governed from first to last by the intricacies and complications of the operations to be handled on expiration of the schooling period.

Cost of Training

THE gross expense of training will be primarily dependent on the number of operatives engaged at any one time. Before the war there was always a distinct possibility of a trainee deciding to refuse work on completion of his instructional course. This involved the further expense of repetitive tuitions. To-day, with the incidence of Government contracts, there is little possibility of that particular cause being the reason for unremunerative training expenditure. Notwithstanding the existence of this domestic safeguard, it is highly desirable that some adequate control system is brought into being to insure that training costs are known. Lack of such knowledge will mean that there is an inappreciation of labour turnover which is of vital importance to the factory well being. The actual statistics of labour turnover are likely to have widespread effects and repercussions, the steadiness or instability of turnover figures being a direct guide to the efficiency of the factory as a complete unit. The turnover statistics will involve outside considerations, principal among which will be:

a. Labour production expenditure.
b. Standard of labour employed.
c. Psychological effect on employees generally.
d. Local opinion.
e. Trade and credit opinions.

✦ ✦ ✦

TO be of internal advantage the actual cost of training must be known to the Executive at all times. For this purpose a 'training account' must be opened. In a large organization where the instructional centre forms an isolated unit set entirely apart from the productive elements, the computation of the total outlay will be a comparatively simple matter. Theye will normally be a staff engaged solely for the purposes of instruction and all salaries, wages and raw materials used are capable of ready separation. Where no actual centre is in operation, all costs and expenses may be allocated through a system of dockets. Entry of these dockets in the training account will allow of statistical control at regular intervals and will demonstrate the relationship of the monthly training costs to the number of operatives on active employment.

✦ ✦ ✦

Instituting a Training Scheme

SYSTEMS must be devised for the instruction of new personnel as well as for the advancement of established employees. In so far as new operators are concerned, it will be understood that present day methods represent a substantial improvement of the old time apprenticeship agreements. The old agreements provided that the apprentice should remain with his tutor for a determined period whilst to-day no such conditional retention of employment exists. Needless to say, at the time of interview and engagement it will be advisable to take on only those applicants who give the appearance of requiring permanent situations.

✦ ✦ ✦

THE transference of employees of some years' standing from one job to another or from one department to another where the work is entirely dis-similar, may have the effect of making those particular employees no better

(Please turn to Page 316)

1942 Pittsburgh Regional Meeting Of The Wire Association

THE Annual Pittsburgh Regional Meeting of the Wire Association was held at the William Penn Hotel, Pittsburgh, Pa., on Friday, May 22nd, 1942, with approximately 160 members and guests in attendance.

✦ ✦ ✦

THE technical session was preceded by a dinner at which **Colonel Frank W. Bullock,** Signal Corps, U. S. Army, was the speaker. Following the dinner, after a short intermission, there was a technical session devoted to the subject of bullet core wire. The details of the meeting follow.

✦ ✦ ✦

PRESIDENT JOHNSON made the welcoming address, and introduced **Mr. Gerald Firth,** who has contributed so much to the success of the Pittsburgh meetings. Mr. Firth reminded us of the last occasion on which he addressed the Association, exactly two years ago, and contrasted world conditions then and now. On that day news had just arrived of the collapse of the French Army, and of the imminent surrender of Belgium. The small British Army, both flanks exposed, was falling back upon Dunkirk and Calais, leaving behind, in the form of military supplies, practically the entire product of two years of feverish industry. Britain was alone, abandoned, stripped of her munitions, and apparently doomed. The one thing she had left was something the enemy has never learned to evaluate, namely guts. Today she is splendidly armed, thoroughly prepared, constantly growing in strength, and backed by powerful allies in the west as well as in the east.

✦ ✦ ✦

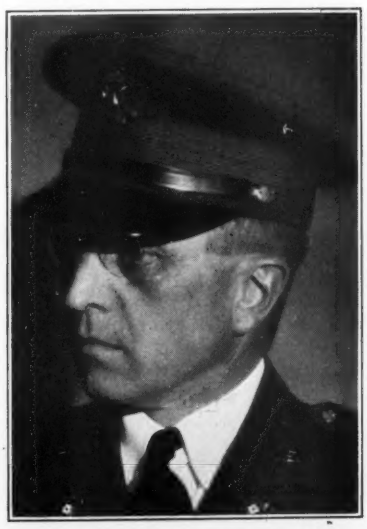
OUR charter member, **Col. Frank Bullock,** was the principal speaker, and gave us, in his usual smooth and entertaining style, a clear picture of the needs of the Signal Corps, and the way in which the wire industry is meeting the situation. He stated that one month's production of field telephone strand would reach to the moon and back eight times, but he refused to confirm or deny rumors that there is an A.E.F. on the moon at this time.

✦ ✦ ✦

AFTER a short intermission President Johnson turned the meeting over to **Mr. Zapp** for the technical discussion. Mr. Zapp introduced **Col. Kirk** and **Mr. Miller,** of the **Frankford Arsenal,** who initiated a discussion of bullet core wire. Army officers are not quoted, these days, and the following account is neither complete, nor, strictly speaking, official. It is a summary of statements, comments, and inferences, and commits nobody to anything.

✦ ✦ ✦

"BULLET Cores" are the slugs from machine guns, and because of the armor on planes and tanks they are, today, armor piercing in character. The early specimens were of chrome-tungsten steel, but because of the scarcity of these metals a manganese molybdenum steel was developed which finally proved even better. The usual calibres are .30 and .50. At the present time the .30 calibre is machined from straightened and cut wire, but the .50 calibre is to a considerable extent cold headed from the coil, and machined only along the Ogive. In both cases the cylindrical portion is centerless-ground, about .001 being taken off.



COLONEL FRANK W. BULLOCK
Signal Corps, U. S. Army
A Charter Member of the Wire Association

✦ ✦ ✦

THE material was first an electric furnace product, but because of a shortage of electric steel it is now made in the open-hearth. A perfect surface is essential, in order that there shall be no cracks on quenching. If a short slug of wire can be pressed down to half the original height without showing cracks the wire may be considered safe. Rods leaving the reels must be slowly cooled in a sheltered location to avoid cracking from cooling stresses. The rods require a long and thorough spheroidizing in controlled atmosphere. They then get a light draft, and are shipped to the arsenal either in the coil or straightened and cut, as ordered.

✦ ✦ ✦

WITH regard to the known fact that the spheroidizing cycle ranges from 9 to 30 hours at different mills, it is not clear whether the difference is due chiefly to the requirements of the various types of finishing machinery, or to the rate of cooling at the rod mill, or both.

✦ ✦ ✦

REQUIREMENTS as to decarburization are not too burdensome. A certain amount of decarb

(*Please turn to Page 309*)

✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

General Conservation Order Makes Many Further Adaptations Necessary

THE recent General Conservation Order M-126 of the WPB vitally affecting thousands of manufacturers was necessitated by the shortage of iron and steel.

✦ ✦ ✦

IN substance it is a stop order on the production of some 400 items, and is the first overall order of this nature. It is expected that others will have to follow later and a further extension of the list of products is probable.

✦ ✦ ✦

THE drastic provisions of this order as well as the tremendous number of manufacturers affected has caused the WPB to decide to hold a series of "Town Hall" meetings, at which the reasons necessitating the issuance of the order, the coverage of the order and the means of appeal from its provisions will be explained.

✦ ✦ ✦

IN many of the items affected, wire is either an important component or is the principal material used in fabrication. From now until further notice materials cannot be sold to product fabricators for any of the 400 items, except as such products are specifically exempted for the recount of various branches of the Government or except, in some cases, for maintenance and repair. A complete list of the products banned and the exceptions can be procured from the Director of Industry Operations, War Production Board, Washington, D. C.

✦ ✦ ✦

AMONG the items affecting the wire industry directly are such products as: ash sieves, automotive accessories, bed spring frames, bird cages, bread racks, carpet rods, coat hangers, corn-poppers, document stands, egg slicers, link fences and ornamental fire place screens, garage hoists, hair curlers, hat frames, hose reels, knitting needles, laundry trays, mechanical book binding wire, millinery wire, necktie racks, permanent wave machines, picture and mirror hardware, steel wool, tongs, wastebaskets, wire parcel handles and holders and wire racks and baskets.

Exports and Imports of Wire

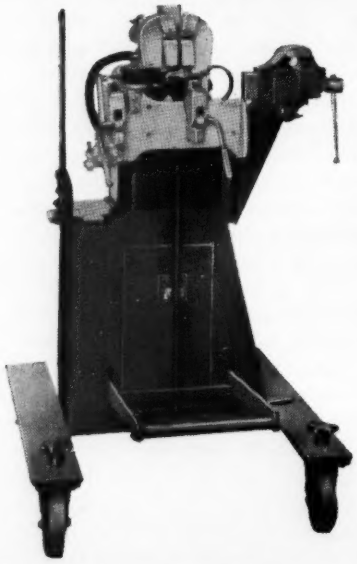
AS a wartime measure to prevent vital information being given to the enemy, the Bureau of the Census has suspended publication of the "Monthly Summary of Foreign Commerce of the United States," beginning with the October issue. As soon as this suspension order is rescinded, we will resume publication of Exports and Imports data.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

Telephone, State 7468

MANUFACTURERS of these and other products will face the alternative of closing down or adapting their production facilities to essential war production. Many have done or are doing this, the one ray of sunshine being the fact that wire constitutes so important a part of every phase of war production — ships, tanks, guns and the whole gamut of war material—that adaptation is possible.

✦ ✦ ✦

Wire Products Advisory Committee

PRICE Administrator Leon Henderson invited 36 steel men to become members of four advisory committees to serve as liaison groups between the Office of Price Administration and the industry on any problems which may arise with respect to prices.

✦ ✦ ✦

THE four advisory units, created under the terms of the Emergency Price Control Act of 1942, are to be known as:

General Steel Products Advisory Committee.
Armament Steels and Alloys Advisory Committee.
Wire Products Advisory Committee.
Cold Finished Bars Advisory Committee.

✦ ✦ ✦

THE Price Control Act stipulates that in the case of any commodity for which a maximum price has been established, the Administrator shall, at the request of any substantial portion of the industry involved, appoint an industry advisory committee. Such requests had been received from a substantial portion of the iron and steel industry.

✦ ✦ ✦

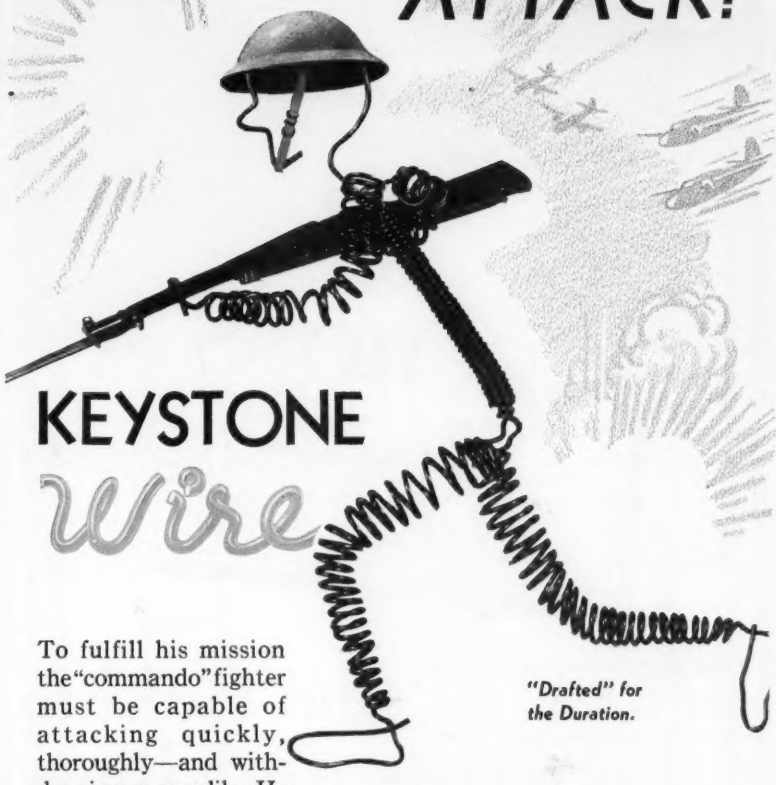
IN order to provide adequate representation for the steel men, whose products are numerous and varied, the Administrator decided to appoint not one advisory committee, but four. Each committee is to represent a different group of products. Additional product committees may be established as the need arises.

✦ ✦ ✦

THE groups, as provided by the Price Control Act, will be purely advisory. They will weigh

(*Please turn to Page 304*)

In the Midst of the ATTACK!



KEYSTONE *Wire*

"Drafted" for the Duration.

To fulfill his mission the "commando" fighter must be capable of attacking quickly, thoroughly—and withdrawing as speedily. He also must be *equipped* for efficient action. And that equipment includes many wire products — bullet cores, armor piercing projectiles, wire rope, ammunition box handles, rifle sling clips, cartridge belt buckles — even down to shoe nails.

By producing . . . quickly . . . such items as these, and hundreds of others, America's wire processing concerns are contributing notably to the effectiveness of the ATTACK. Tremendous tonnages of the right types of wire for these uses is important, too. And by pointing their production almost entirely in this direction, the country's wire mills are daily "in uniform". Thus, among the ranks of America's wire and wire product manufacturers, Keystone intends to do its utmost to help bring victory ever closer.

KEYSTONE
STEEL & WIRE CO. Dept. W PEORIA, ILLINOIS

HIGH CARBON OR LOW CARBON

SAMSON SPRING WIRE
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright-Tinned
Coppered
Annealed
Galvanized

New ROSS Wire Baker

SPEED UP the Baking of Wire and Rods

The Ross Wire and Rod Baker utilizes High Temperature Air that is entirely free from all products of combustion. The circulation of this clean heated air not only dries your product in much less time but prevents the rusting often caused by older methods of baking. It insures a soft smooth lime coat that lengthens the life of drawing dies.

Whether your requirements are for a new baker or the revamping of your present unit, write us for full particulars.

J. O. ROSS ENGINEERING CORPORATION

Main Office—350 MADISON AVENUE., New York, N. Y.

CHICAGO—201 North Wells Street DETROIT—12953 Greeley Avenue

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

Government Wire Production Information

(*Continued from Page 303*)

any problems arising in connection with Revised Price Schedule No. 6, on iron and steel products, or allied or future orders affecting the steel industry.

✦ ✦ ✦

THE Administrator, at the request of the advisory units, from time to time will meet with them for the purpose of advising and consulting on any problems arising from the price schedule, its form, or classifications, differentiations and adjustments under the schedule.

✦ ✦ ✦

INVITED to serve on the wire products committee are:

H. J. Blaser
Seneca Wire & Manufacturing Co.
Fostoria, Ohio
John Graham
American Steel & Wire Company
Cleveland, Ohio
N. L. Hite
Continental Steel Corporation
Kokomo, Indiana
Ernest C. Low
John A. Roebling's Sons Company
Trenton, New Jersey
Henry Roemer, Jr.
Pittsburgh Steel Company
Pittsburgh, Pennsylvania
Ford Schusler
Keystone Steel & Wire Company
Peoria, Illinois
C. F. Stone
Atlantic Steel Company
Atlanta, Georgia
E. C. Stout
Wickwire Spencer Steel Company
New York, New York
G. F. Wright
G. F. Wright Steel & Wire Co.
Worcester, Massachusetts

✦ ✦ ✦

Advisory Committee for Wire

THE Bureau of Industry Advisory Committees has announced the formation of a Pipe, Wire Products and Galvanized Sheet Jobbers Subcommittee of the Iron and Steel Industry Advisory Committee.

✦ ✦ ✦

C. E. ADAMS, Chief, Iron and Steel Branch, is the Government Presiding Officer. Members of the Committee are:

Henry J. Allison
Glasgow-Allison Company
Charlotte, North Carolina
Wakefield Baker
Baker-Hamilton & Pacific
San Francisco, California
A. J. Becker
Ohio Valley Hdwe. & Mfg. Company
Evansville, Indiana

Thomas A. Fernley, Jr.
Nat'l Wholesale Hdwe. Ass'n
Philadelphia, Pennsylvania

Henry A. Hoeynck
Shapleigh Hardware Company
St. Louis, Missouri

Charles Igoe
Igoe Brothers
Brooklyn, New York

A. C. Rankin
Teague Hardware Company
Montgomery, Alabama

M. W. Denison
Braman-Dow & Company
Boston, Massachusetts

William French, Sr.
Moore-Handley Hdwe. Company
Birmingham, Alabama

S. C. Hinkle
Mine & Smelter Supply Company
Denver, Colorado

N. J. Higginbotham
W. A. Case & Son Mfg. Company
Buffalo, New York

Lucien W. Moore
Crane Company
Chicago, Illinois

✦ ✦ ✦

Brass and Copper Mill Suppliers Given New Rating

SUPPLIERS of maintenance and repair parts to copper and brass mills have been given an A-1-c rating by the Director of Industry Operations to enable them to replenish inventories when they have filled orders bearing an A-1-c or higher rating from the mills. Their previous rating for this purpose, A-3, was found insufficient to keep them supplied.

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THE action was taken in an amendment to Order P-106, which grants a rating of A-1-a to mills for actual breakdowns and A-1-c to avert a threatened breakdown. No change is made in these ratings. The expiration date of the order is set as June 30, 1942.

✦ ✦ ✦

WPB Aids Furnace Manufacturers

PREFERENCE Rating Order P-74, which grants a rating of A-1-c to enable producers to obtain materials for the construction of heat-treating furnaces, has been extended until midnight, June 30, by the Director of Industry Operations. The order was due to expire on May 15.

✦ ✦ ✦

AFTER that date, all holders of P-74 ratings will be expected to qualify under the Production Requirements Plan.

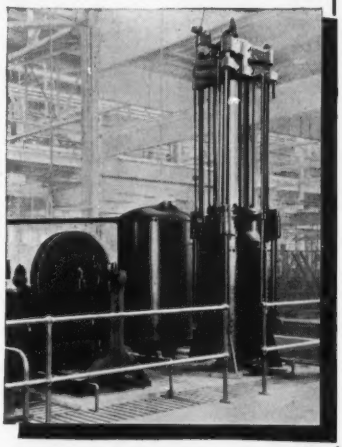
(*Please turn to Page 306*)

Increased production without plant enlargement is frequently a vital factor today. That's precisely why you will be so interested in this outstanding Robertson design and construction with its great saving of space, in conjunction with highest efficiency and absolute safety.

ROBERTSON

Hydro Pneumatic Accumulator utilizes its tank as its base . . . needs no special foundation . . . can be set up quickly . . . in a few square feet of floor space.

HYDRO-PNEUMATIC ACCUMULATOR



AT J. A. ROEBLING'S SONS CO.

Always feel free—without obligation—to consult Robertson Engineers. Their experience in design, maintenance and servicing is whole-heartedly at your command. Our purpose is to provide the unit with highest operating efficiency for your particular needs.

John Robertson Co. Inc.

125-137 WATER ST. BROOKLYN, N. Y.

Designers and Builders of

All types of lead encasing machinery for rubber hose and electrical cable manufacturers, including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-pneumatic Accumulators and Lead Sheath Stripping Machines.

Government Wire Production Information

(*Continued from Page 305*)

Metallic Zinc Allocation To Begin June 1

METALLIC zinc was placed under complete allocation control beginning June 1, WPB announced May 1. An amended Order M-11 setting up the zinc allocation plan was issued and at the same time Order M-11-a was issued which places zinc oxide and zinc dust under the pool arrangement by which all zinc has been controlled heretofore.

✦ ✦ ✦

New Order on Insulating Tape

TO assure an adequate supply of industrial cloth or tape, for insulation in electrical cables and for other essential purposes, the WPB has issued an order (M-134) assigning a preference rating of A-2 to purchase orders for cotton textile fabrics from which tape is made.

✦ ✦ ✦

THE order specifies certain constructions of osnaburg, sheetings, print cloths, card lawns, and tubings as fabrics suitable for the manufacture of cloth and tape.

✦ ✦ ✦

INVENTORIES of tape manufacturers are restricted to a 60-day supply of "grey goods", suitable for tape but not put into process for the manufacture of tape, or a 30-day supply of partially processed cloth.

✦ ✦ ✦

AN intermediate processor, who puts the unprocessed fabric through the first stages of production but does not complete the tape, is permitted to have a 60-day supply on hand.

✦ ✦ ✦

SO far as the wire industry is concerned this order relates to varnished cambric tape for insulating, used almost entirely in the manufacture of electrical cable.

WPB Forbids Copper and its Alloys for a Hundred-odd More Civilian Products

THE War Production Board on May 7 prohibited the use of copper and its alloys, including brass and bronze, in an additional hundred-odd civilian products; curtailed other uses after June 15, and ordered a number of other restrictions designed to conserve supplies of the red metal.

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THE action was taken in a revision of Order M-9-c, issued by Industry Operations Director Knowlson. M-9-c originally was issued on October 21, 1941, and has been amended frequently.

✦ ✦ ✦

New Ban Applies May 31

THE May 7 order maintains the list A of the previous order in substantially the same form. Use of copper in the manufacture of articles on this list was prohibited after March 31, 1942.

✦ ✦ ✦

A NEW list, A-1, is added. Items on this list must not be manu-

ANNUAL MEDAL AWARD of the WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON WIRE MANUFACTURE OR FABRICATION DURING THE YEAR

— BY A MEMBER OF THE WIRE ASSOCIATION —

✦ ✦ ✦

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Convention.

✦ ✦ ✦

AN annual medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Program Committee and the Board of Directors of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

RICHARD E. BROWN,

SECRETARY, THE WIRE ASSOCIATION

300 MAIN STREET

STAMFORD, CONNECTICUT

factured, assembled or finished after May 31.

✦ ✦ ✦

PROBABLY the greatest dislocation the order will cause will be by the ban on manufacture of the common household pin. Approximately one-third of the pins manuactured in 1940 and 1941 were made of brass, with the remainder of steel. There is no ban on steel pins, but the rate of production is limited.

✦ ✦ ✦

Metal for Hairpins

THE WPB has restricted the amount of metal to be incorporated in hairpins and bobpins and regulated their length and thickness to obtain the maximum number of such articles from the amount of metal that may be used.

✦ ✦ ✦

THE order (L-104) provides as follows:

1. **During the 90-day period beginning April 25, a manufacturer may use one-eighth as much metal in hairpins and bobpins as he used during the entire year 1941. This means a 50 percent cut in the use of metal.**
2. **Effective at once, no manufacturer may acquire any wire for use in hairpins and bobpins except low carbon steel wire of a gauge less than .035 inches. Metal hairpins are now made of low carbon steel wire and thus will not be affected by this part of the order. But bobpins are now made of high carbon steel wire, and the restriction means that after a manufacturer has used up his present supply of high carbon steel wire he can get no more. The gauge restriction will eliminate future production of heavy hairpins which run as thick as .055 inches. Most hairpins in use today will not be affected by the gauge restriction.**
3. **Beginning May 6, no manufacturer may produce a metal hairpin or bobpin longer than two inches. Metal hairpins now range from 1½ to four inches, with most of them approximately 1¾ inches long. Bobpins now average 1⅞ inches.**
4. **Effective at once, metal hairpins may not be sold by a manufacturer in packages containing more than 99 hairpins.**

✦ ✦ ✦

W.P.B. Order L-93 Prohibits Use of Steel in Golf Club Manufacture

GOLFERS will be affected by an order issued recently by W.P.B. which curtails and will soon stop construction of golf clubs.

✦ ✦ ✦

THE order (L-93) cuts off the use of iron and steel, other critical metals, plastics and cork, in the manufacture of golf clubs after May 31st. Meanwhile, limited production will be permitted.

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UNDER the order, the amount of iron and steel that may be used in golf clubs during the remainder of April and May is cut to 50% of average use for an equal number of days during 1941.

✦ ✦ ✦

THE golf club industry consists of 14 companies, which normally consume the following amounts of critical materials annually:

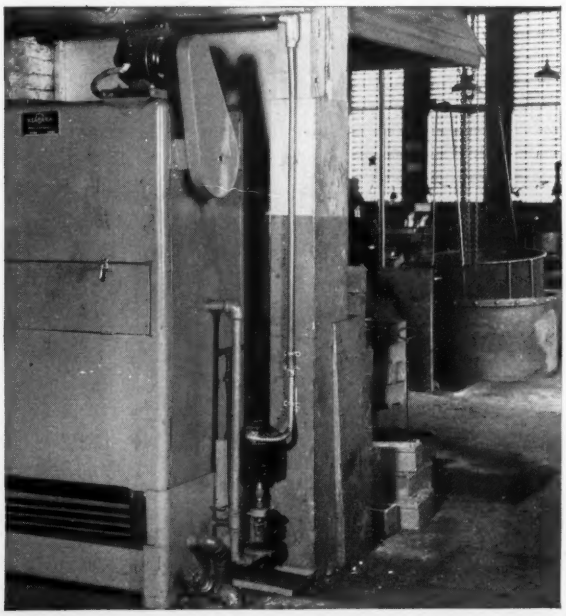
✦ ✦ ✦

IRON and steel, 3,000,000 pounds; aluminum, 20,000 pounds; chromium, 36,000 pounds; brass, 68,000 pounds; cork, 22,000 pounds; lead, 68,000 pounds; nickel, 1,400 pounds; plastics, 34,000 pounds.

(*Please turn to Page 319*)

CONTROLLED TEMPERATURE QUENCHING . . .
IMPROVES PHYSICAL PROPERTIES OF STEEL AND INCREASES PRODUCTION

It is recognized that control of quenching oil temperatures is important to uniform quality and increased production.



Niagara AERO HEAT EXCHANGER accurately controls quenching oil temperature. It is designed to remove heat at the rate of input. It saves 95% of the cooling water consumed by shell-and-tube coolers.

Write for Bulletin #90 and information based on experience with heat-treating, wire drawing, strip steel rolling, lubricating oils, hydraulic fluids, jacket water and other industrial liquids.

NIAGARA BLOWER COMPANY
Dept. WP-62
6 E. 45th Street New York City
37 W. Van Buren St., Chicago, Ill.
Fourth & Cherry Bldg., Seattle, Wash.
673 Ontario St., Buffalo, N. Y.
Sales Engineers in Principal Cities

NIAGARA
INDUSTRIAL COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING *EQUIPMENT*

Outstanding Personalities of the Wire Industry

American Brass Company Elects Executives

DIRECTORS of the American Brass Co., elected the following executives for the current year at meeting held in Waterbury, Conn., on May 1st.: Chairman of the board, **John A. Coe**; president, **Clark S. Judd**; executive vice-president, **Arthur H. Quigley**; treasurer, **Edwin J. Rockwell**; secretary, **Edwin J. Rockwell**; comptroller, **W. Kenneth Daly**; assistant treasurer, **Major W. Judge**; assistant treasurer. **Samuel A. Case**; assistant secretary, **S. Burnham Terry**, assistant secretary, **Charles E. Steele**; assistant secretary, **Harvey S. Thomas.**

✦ ✦ ✦

AT the stockholders' meeting which was held in New York City, April 9th, the following directors were chosen: **Cornelius F. Kelly, John A. Coe, Clark S. Judd, James R. Hobbins, Robert E. Dwyer, Arthur H. Quigley** and **John A. Coe, Jr.**

✦ ✦ ✦

W. A. Givens, Executive Vice President, Allegheny Ludlum Steel Corporation

AT the annual meeting of stockholders, **W. A. Givens,** was elected to the newly created position of executive vice president of the Allegheny Ludlum Steel Corp. He was succeeded as vice president in charge of manufacturing by **Frank B. Lounsberry.**

✦ ✦ ✦

THE following officers were re-elected: Chairman of the board, **W. F. Detwiler**; president, **H. G. Batcheller**; vice president and technical director, **V. B. Browne**; vice presidents, **James O. Carr, E. B. Cleborne, A. F. Dohn, Lewis W. Hicks,** and **F. H. Stephens**; secretary-treasurer, **E. J. Hanley.**

Sidney P. Cary, Gen. Supt., Buffalo Bolt Company

SUCCEEDING the late **George F. Blasier,** who passed away on April 9th, **Sidney P. Cary** has been named general superintendent of the Buffalo Bolt Company, North Tonawanda, New York. Mr. Cary was formerly assistant general superintendent.

✦ ✦ ✦

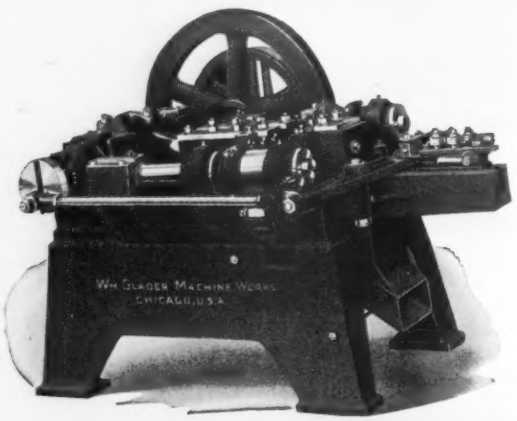
H. S. Worthington, Asst. V. P. Chg. Oprs., Pittsburg Works, Columbia Steel Company

IT was recently announced that **H. S. Worthington,** general superintendent of the Pittsburg, Calif., works of the Columbia Steel Co., has been appointed assistant vice president in charge of operations with offices in San Francisco.

✦ ✦ ✦

MR. WORTHINGTON was succeeded by **Joseph A. White,** formerly assistant general super-

GLADER WIRE NAIL MACHINE SCORES AGAIN



WM. GLADER MACHINE WORKS

210 N. Racine Ave. Chicago, Illinois

A new Wire Mill under construction in the State of Texas will install GLADER WIRE NAIL machines 100%.

The production figures on common nails shown below, are guaranteed.

SIZE MACH.	SIZE WIRE	MAX. LENGTH OF WIRE	NUMBER OF NAILS PER MIN.	CAP. IN POUNDS PER HR.
#00A	#16	1⅛"	700	37.2
#00	#14	1¼"	550	55
#0	#12	1¾"	450	89
#1	#10	2½"	400	192
#2	#8	3½"	325	310
#3	#4	5"	225	523
#4	#1	7"	190	622
#4s	5/16"	9"	175	1155
#5	⅜"	12"	160	2400

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

intendent, and **J. D. McCall**, assistant general superintendent at Torrance became Mr. White's assistant. **Harlow Dotson** has assumed Mr. McCall's position at the Torrance Works.

✦ ✦ ✦

Robert Gilmore

ROBERT GILMORE, 63, general manager of the wire rope division of the Jones and Laughlin Steel Corporation at Muncy, Pa., died on May 14th.

✦ ✦ ✦

MR. GILMORE, who had been associated with the wire rope industry for the past 50 years, started with Jones and Laughlin in July, 1938. He was a pioneer in wire rope development work and was widely known throughout the industry.

✦ ✦ ✦

C. H. Selby

C. H. SELBY, Managing Director of British Ropes Canadian Factory, Ltd., Granville Island, Vancouver, B. C., and a member of the Wire Association, passed away on Friday, May 15th.

✦ ✦ ✦

MR. SELBY'S successor has not as yet been appointed.

Pittsburgh Regional Meeting

(*Continued from Page 301*)

appears to delay the shattering of the slug until it has pierced the armor, and is therefore an asset. Too much of it interferes with machining operations, as well as providing a possible focus for fatigue defects. Total and partial decarb to the depth of .015 will usually be acceptable, and if the quenched slug tests soft on the cylinder, some metal is ground off to get a test further down. Nothing definite was set up as a limit, but the impression prevailed that .015 would probably be passed, other things being in order.

✦ ✦ ✦

WE believe this much information can safely be published. After all, we are sending samples to both Hitler and Hirohito daily, and possibly they will reciprocate by telling us how they act after they've penetrated the armor.

FULL SPEED Ahead
with
TECO
Carbide Dies
FULL
WIRE and BAR DIES
EXTRUDING DIES
TUBING DIES
SIZING DIES
★
Carbide Blanks, Tools, Bits, Reamers, Broaches, Forming Tools
Wire output depends not only on the speed but also on the continuity of the drawing operation. Teco Carbide Dies, because they last longer, save down-time of the wire machine—an item which is often a costly one where inferior dies are used. Extraordinary tonnage within acceptable tolerances, perfect finish, and the reduction of friction and wear to a minimum, are characteristic of Teco Dies. And whether you use a dozen or a hundred, you will get the same performance from each—for uniformity is another Teco strong point.
TUNGSTEN ELECTRIC CORPORATION
564 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Pioneers in Tungsten Carbides for Over a Quarter Century
TECO

A Review of Recent Wire Patents

No. 2,278,411, SCREW, patented April 7, 1942 by Felix W. Braendel, Union City, N. J., assignor to Groov-Pin Corporation, Union City, N. J., a corporation of New York.

This is a method of rolling a self-cutting screw from a blank having a cylindrical shank, and consists in rolling a thread about its entire length and simultaneously rolling longitudinal grooves along the lower part of the blank to form a cutting section and displacing metal from the shank beyond the cutting section to enlarge the thread diameter thereat, thereby to compensate for the enlargement of cutting section diameter due to the impression of the longitudinal grooves therein.

✦ ✦ ✦

No. 2,278,859, FLANGED WIRE FABRIC, patented April 7, 1942 by Ernest Linwood Blackburn, Audubon, N. J., assignor to Korb-Pettit Wire Fabrics & Iron Works, Inc., Philadelphia, Pa., a corporation of Pennsylvania.

This fabric is formed of coiled wires and has pivot wires by which the coiled wires are interconnected in the fabric against separation lengthwise, whereby lengthwise extension of the fabric is prevented, while the coiled wires are free to move relative to one another for flexure of the fabric.

✦ ✦ ✦

No. 2,278,860, FLANGED WIRE FABRIC, patented April 7, 1942 by Ernest Linwood Blackburn, Audubon, N. J., assignor to Korb-Pettit Wire Fabrics & Iron Works, Inc., Philadelphia, Pa., a corporation of Pennsylvania.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

Transversely extending pivot wires interconnecting coiled wires in the main body of the fabric are provided to permit flexure of the latter, each of the pivot wires having one of its ends terminating in the main body portion and its other end terminating in the flange.

✦ ✦ ✦

No. 2,279,174, WIRE DRAWING APPARATUS, patented April 7, 1942 by Weld Morgan, Worcester, and John N. Whalen, Boylston, Mass., assignors to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts.

Means is provided, in this disclosure, to vary the cast of wire.

✦ ✦ ✦

No. 2,279,415, METHOD AND APPARATUS FOR DRAWING STRIP, patented April 14, 1942 by Aaron Simons, Bronx, N. Y.

A pair of elongated die members as provided with means for drawing the workpiece between the die members, a pair of friction bearings extending throughout the length of and operatively engaging each die member, means for rotating the bearings to frictionally rotate the die members, and means for reciprocating the die members in opposite directions to each other transversely of the direction of travel of the workpiece and longitudinally of the axes of the die members while the die members are rotated on their axes.

✦ ✦ ✦

No. 2,280,415, APPARATUS FOR THE COATING OF WIRES, CABLES, TEXTILE THREADS, AND STRIPS, patented April 21, 1942 by William Oliver Larmuth, Alpraham, near Tarporley, England, assignor to Rotalac Limited, Lymm, Cheshire, England, a British company.

This apparatus is adapted to coat the wire with cellulose esters contained in a vessel, a pair of dies being mounted exteriorly of the vessel.

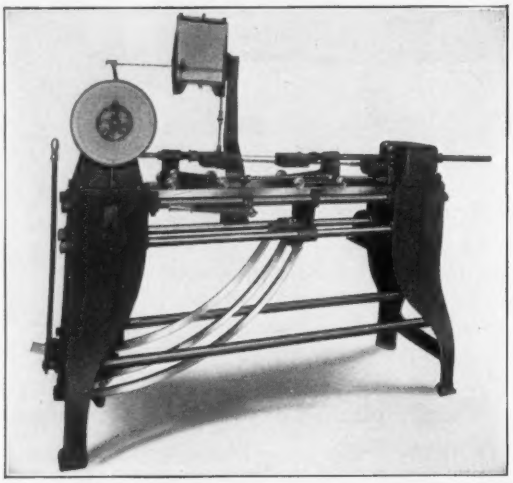
✦ ✦ ✦

No. 2,280,840, WIRE SPRING FOR CUSHIONED SEATS OF UPHOLSTERED FURNITURE, patented April 28, 1942 by William H. Neely, Cleveland, Ohio, assignor, by direct and mesne assignments, to John C. Lincoln, Scottsdale, Ariz.

A number of wire springs bridge the seat frame crosswise thereof, each of the springs including a horizontally corrugated, axially yielding seating portion, an integral rearwardly and downwardly extending yielding lever arm extending from one end of the seating por-

SCOTT TESTERS

Model IP-2
Maximum capacity
2 pounds



Model Q-5
Maximum capacity
2000 pounds

AUTOGRAPHIC recording tensile testing machines built on either the constant specimen rate of load or constant speed of pull principles. Made in a wide range of models and capacities with high and low stretch magnification recorders - for Wire, Sheet Metals, Rubber, Textiles, Paper, etc.

HENRY L. SCOTT CO.

P. O. BOX 963 PROVIDENCE, R. I.

tion, an integral upwardly and rearwardly inclined short lever extending from the other end of the seating portion, and attachment means integrally extended from the free ends of the levers, the upward and rearward arrangement of the short lever preventing undesired stiff areas being upwardly extended near the other end of the seating portion when a load is placed on the spring.

✦ ✦ ✦

No. 2,280,912, SPRING STRUCTURE, patented April 28, 1942 by Henry Hopkes, Grosse Pointe, Mich., assignor to No-Sag Spring Company, Detroit, Mich., a corporation of Michigan.

The top surface (resilient wire support) is sensitive to light loads while under heavier loads, the deflection decreases in inverse ratio.

✦ ✦ ✦

No. 2,281,016, HIP BOOT DRYING HANGER, patented April 28, 1942 by Merritt Dan Barney, Billings, Mont.

A pair of wire rings, one being of slightly smaller diameter than the other, are provided to form a hanger for drying hip boots, the smaller wire ring having a strap handle and encircling the outer surface of the overlapped boot leg while the other wire ring is disposed underneath the overlapped leg and directly above the smaller ring.

✦ ✦ ✦

No. 2.281,132, METHOD OF WIRE DRAWING, patented April 28, 1942 by Leonard A. Young, Detroit, Mich.

This process of drawing carbon steel wire having a carbon content of .50% to .70% the steps of electrically heating a continuously moving wire to a predetermined temperature by two stationary electric contacts, and thereupon passing the wire through a drawing die, the die being disposed at such a predetermined distance beyond the second contact that a portion of the wire heated between the contacts enters the drawing die at a temperature of 350° to 450°F.

✦ ✦ ✦

No. 2,281,179, PRODUCTION OF RUSTLESS IRON, patented April 28, 1942 by William B. Arness, Baltimore, Md., assignor to Rustless Iron and Steel Corporation, Baltimore, Md., a corporation of Delaware.

More specifically the process relates to castings of fine-grained chromium iron, and comprises forming a melt containing iron; adding to the melt an iron-chromium-nitrogen prealloy containing about 60% to 70% chromium and .5% to 1% nitrogen, the ratio of nitrogen to chromium in the prealloy being between about 1:140 and 1:75; and then casting the melt.

✦ ✦ ✦

No. 3,381,375, ELECTRICAL INSULATION, patented April 28, 1942 by Paul Nowak, Berlin-Charlottenburg, Germany, assignor to General Electric Company, a corporation of New York.

Invention lies in the insulation for the wire conductor, and comprises a vulcanized mixed polymer of butadiene and acrylic acid nitrile and a partially depolymerized mixed polymer of butadiene and styrene as a plasticizer therefor.

Cuba

ARRIVAL in 1941 of 56,315 metric tons of iron and steel in Habana, port of entry for more than 60 percent of Cuban imports, compares with 43,126 tons received during the preceding year, according to compilations from ships' manifests. Increases were noted in tin plate, plates, tubular products, barbed wire, wire nails, fence staples, and poultry netting, while decreases were seen in imports of bars, plain wire, and corrugated sheets.

THE fairly active movement of iron and steel products into consumption was aided by the demand for material for construction, which was well maintained during most of 1941. Prices tended higher during the year, especially in some branches of the trade. A Government decree of November 5, 1941, set the maximum price for sale to the public of steel reinforcing bars and rods, classifying them as "articles of prime necessity."

DRAW • STRAND • TAKE-UP • TEST • SHIP

Steel Wire for War

ON HUBBARD SPOOLS & REELS

Here are the spools and reels you need, to meet your war time steel wire production requirements.

For over 29 years, Hubbard engineers have been aggressively designing and perfecting better spools and reels for the steel and copper wire industries. Electro-welded-steel construction and patented die-formed head tires are just two of the many Hubbard construction features that assure essential strength, minimum weight, balance, and long life.

Today, when you want the best in a hurry, as well as engineering assistance you can depend on, let Hubbard equipment and Hubbard experience lend you a hand. Give us the facts on the job you must do and we'll send you complete details on the spools and reels that apply.

HUBBARD SPOOL COMPANY

1624 CARROLL AVENUE | CHICAGO, ILLINOIS

Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.

(*Continued from Page 293*)

vention that she thought might be of some value if properly handled. Mr. Campbell put her at her ease, and finally asked her point-blank what was the invention. Well, she said, she didn't know whether it really was of any value, but it was a noiseless lawn-mower. "Great Scott, Madam," said Mr. Campbell, "that's worth just about a million dollars!" "Here," he said, pushing a pencil into her hand, "show me how it works." "Oh, Mr. Campbell, she said, "I thought you'd work that out for me!"

✦ ✦ ✦

THE fact is that the **Reuther Plan** was not a plan. It was a neat little bit of propaganda, designed to make dumb people think just what this friend of yours thought. It was also a long shot at getting the nose of the union camel into the managerial tent, just to see what would happen. It didn't work. It will never work. You can't get a good working mixture by throwing together people whose instinct drives them ever forward toward more and more production per man-hour and people whose days and nights are devoted to schemes to produce less goods per pay-roll dollar.

✦ ✦ ✦

AN Irishman riding on a donkey once found that the animal, in trying to dislodge a fly, had caught his hoof in one of the stirrups. He said, "Begobs, if you're goin' to come up here, I'm goin' to get down!" When **Brother Reuther** and his gorillas move into the office we'd better move out to the benches. Then we can organize our own union, and boy, will we go to town on the liquid assets! It will be like the farm in Vermont that consisted of three inches of top-soil over solid granite. The place was a ruin, fences down, roof leaking, weeds everywhere. A passer-by, stopping for a drink of water, questioned the farmer. "I see you keep a hired man," he said. "Pardon my curiosity, but how in Hell can you pay a hired man out of what you can scrape out of this outfit?" "Good gosh, stranger," said the farmer, "I can't pay him, but I have to keep him. He's part of my economic system. He works for me till his back wages run so high that I have to deed the farm to him. Then I work for him. He can't pay me, so I get the farm back, and then we start all over again."

✦ ✦ ✦

I NEEDN'T bother you with any more examples. You get the idea. Prepare your cases in advance. Wait for your cue. Start easily and politely. Keep buzzing, buzzing, buzzing, at the weak spot till your victim gets wacky, then go to town on him. When you really get him down, have no mercy. Remember what they're doing to us.

✦ ✦ ✦

YOU will know how to handle such absurd attacks as are constantly being directed at **Standard Oil**, the **Aluminum Co.**, and others. They are designed as smoke screens to cover up the ghastly bureaucratic bungling of our affairs at Washington. My brother-in-law was parked in front of the City Hall one afternoon, reading

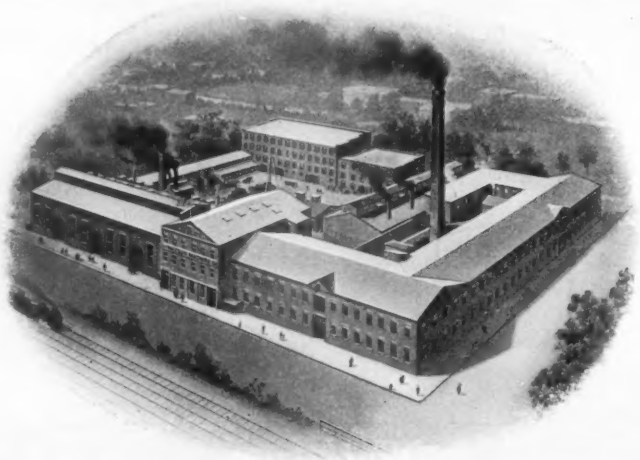
THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

Stranders
Bunchers
Cablers
Closers
Armor. Machines
Tapers
Juters
Serving Heads
Compound Tanks
Saturating Tanks
Powderers and Chalkers
Capstan Sections



Let-offs
Gang-Spoolers
Re-winders
Capstan Takeups
Continuous Takeups
Heavy-Duty Takeups
Traverses
Measuring Mach's.
Testing Mach's.
Vulcanizers
Polishers
Reel Crutches

MEAS. MACH'S. TRAVERSES, REEL CRUTCHES, BUNCHERS, SMALL POWDERERS, ETC. — USUALLY CARRIED IN STOCK

LITERATURE AVAILABLE ON ALL LISTED UNITS

the paper, and waiting for his wife, when a car ran into him from behind and shook him a little. He folded up the newspaper and decided to go back to see if his bumper was scratched, and before he could open the car door a little Jewish citizen bounded up to him and yelled "Vat did you back into me for?" That's **New Deal** strategy.

✦ ✦ ✦

IF all else fails, try poetry. The **New Deal** is dreadfully sensitive to ridicule, and as a general rule your points can be put over better in verse than in prose. You have a wider choice of words, and a wealth of imagery at your command. I can't prepare you for every emergency, but I have put some verses together to indicate a typical line of attack. Here they are.

✦ ✦ ✦

(Editor's note: On account of the shortage of paper, and other considerations, it has been decided to omit these verses. The printer is experimenting with Nicrome type on asbestos board, and they may yet be made available to a selected group of subscribers).

✦ ✦ ✦

Expanded Cleaning Service

THE change-over of the metal industries from domestic to war production, combined with the rapid turn-over in personnel in many plants, has placed a serious strain on the efficient operation of industrial cleaning equipment.

✦ ✦ ✦

TO better serve the users of all kinds of cleaning equipment and materials, the **Detroit Rex Products Company**, Detroit, Michigan, is increasing its field service engineering force by more than 30 percent.

✦ ✦ ✦

THIS new service is without cost and includes consultation on all types of cleaning operations and the training of new operators of cleaning equipment in its correct operation and maintenance. Efficient use of equipment, the conservation of cleaning materials, and the cleaning of work to meet the most rigid specifications of quality and speed are vitally important.

✦ ✦ ✦

Selecting a Salt Bath Furnace

"WHERE Should Heat Treating Heat Go?" is the title of a recently issued 4-page folder which discusses the various types of internally heated salt bath furnaces and pots, gives hints on their selection, tells how to avoid superheating and rapid decomposition of carburizing salts, and describes and illustrates the effect of pot shapes on the flow of heated salt, and comments on the types of furnaces and pots required for hardening of "Moly" and High Speed steels, etc.

✦ ✦ ✦

IN view of the broadening use of salt baths for heat treating, this booklet will have a timely interest for many of our readers, and may be secured by addressing the **Upton Electric Furnace Div.**, 7450 Melville Ave., Detroit, Mich.

Due to war conditions
WIRE & WIRE PRODUCTS
has suspended delivery of the magazine to the following countries:

AUSTRIA, BELGIUM, CHINA, CZECHOSLOVAKIA, FRANCE, GERMANY, HOLLAND, ITALY, JAPAN, JUGOSLAVIA, NORWAY, POLAND, PORTUGAL, ROUMANIA and SWEDEN.

All subscriptions unfulfilled at the time of discontinuance will be completed after we have won the war.

Power plants control the flow of air for combustion by regulating the draft loss through boiler passes. One of the necessary robots to control the boiler is a Low Differential Pressure Controller made by the *Hays Corporation*.

▶ Springs formed by Instrument Specialties Company of Callite beryllium copper wire are used for the calibration of these controllers.

▶ This is but one of countless applications for Callite fine wires. When your reputation, and that of your customers, hangs by a wire—insist on Callite. Our engineers will gladly recommend most suitable composition for your specific needs.

Callite Tungsten Corporation, 572 — 39th Street, Union City, N. J. Branches: Chicago, Cleveland.

Callite Wires

CALLITE FINE WIRES
in sizes as small as .002" furnished in these metals and alloys . . . for spring, control cables, instruments, control devices, wire cloth, scratch brushes and other applications.

ALUMINUM
BERYLLIUM COPPER
BRASS—ALL GRADES
BRUSH WIRE
COMMERCIAL BRONZE
EVERDUR
NICKEL-SILVER
PHOSPHOR BRONZE
SILVER
SPECIAL ALLOYS
STAINLESS STEEL

CALLITE TUNGSTEN CT

A FINE WIRE FOR EVERY NEED

Zinc Coating on Wire

(*Continued from Page 290*)

air, should be applied. In this process the preparation and the activation might actually be accomplished with just one step.

✦ ✦ ✦

WIRE to be electrogalvanized requires a somewhat more careful activation than wire to be hot dipped. The adherence of the coating depends on the appropriate activation of the metal surface. The activation is accomplished by one or a series of steps which culminate in an "anodic flash" in sulfuric acid solution in all commercial processes. Control of this anodic flash is very critical, because instead of having an active surface a passive film may be produced on the surface of the metal to be coated. This passive film prevents any bonding—better said adherence — between the metal surface and the metal coated. Adherence is one of the primary requirements in specifications as pointed out at the beginning of the article.

THE activation of the wire is accomplished by subjecting it very briefly to a current while passing through the sulfuric acid solution of appropriate concentration. The wire is made anodic by connecting it to the positive terminal of a direct current generator. The negative terminal is connected either to the steel tank, or to proper cathodes dipped in the acid and running parallel to the wire.

✦ ✦ ✦

THE following reaction takes place during this step:

$$Fe + 2^{\oplus} \leftrightarrows Fe^{++} \quad (7)$$

which causes any passive film to be destroyed. This anodic flash if not properly controlled, — acid strength, current density and time, —may cause the production of smut or smudge on the surface of the steel wire. This is next to impossible to remove making the wire unsuitable for plating. This smut impairs the adherence between the surface to be coated and the metal coating.

Part II covering (3) Coating, (a) Hot Galvanizing and (b) Electrogalvanizing; (4) Finishing; (5) Economics of Coating; (6) Testing and Specifications; Conclusions and Bibliography will be published in the July issue of WIRE & WIRE PRODUCTS.

Magnus Establishes New Machine Division

A MACHINE division for the manufacture of mechanical metal washing machines, pickling machines, driers, ovens and burnishing equipment, is announced by the Magnus Chemical Co., Inc., Garwood, N. J. The Magnus Company manufactures cleaning materials, industrial soaps, metallic soaps, sulfonated oils, emulsifying agents and wire drawing lubricants.

✦ ✦ ✦

THE new division will be directed by **Marcel Zinty**, previously general manager of the Magnus factory in Europe.

★ SPECIAL NOTICE ★

The Wire Association Annual Convention

and the

National Metal Congress And Exposition

WILL BE HELD AT CLEVELAND, OHIO

OCTOBER 12-16, 1942

Instead of at Detroit, Michigan as Previously Announced.

Headquarters of The Wire Association

CARTER HOTEL, Cleveland, Ohio

The change in location for the Annual Convention is due to the fact that the U. S. Army has taken over the facilities which would ordinarily be used by the Exhibit of the National Metal Congress, thus eliminating the City of Detroit as a place in which the Convention can be held this year.

PLEASE CHANGE YOUR RECORDS ACCORDINGLY

Steel Welding Wire Output Rose 90% in 1941

PRODUCTION of steel welding wire by the steel industry in 1941 totaled approximately 453,120,000 pounds, a new high record, according to the American Iron and Steel Institute.

✦ ✦ ✦

LAST year's output was nearly 90% greater than the 238,795,000 pounds of welding wire produced in 1940 and 147% greater than the 183,436,000 pounds made in 1939.

✦ ✦ ✦

THE sharp increase in the manufacture of welding wire last year reflects in part the heavy production of war equipment of all kinds.

✦ ✦ ✦

FROM 1932 to 1941, production of welding wire rose 1,776%. That gain was nearly four times as large as the increase in steel ingot production since 1932.

✦ ✦ ✦

FOR each ton of finished steel produced last year, over seven pounds of welding wire were made, compared with nearly five pounds in 1940, and approximately the same figure in 1939.

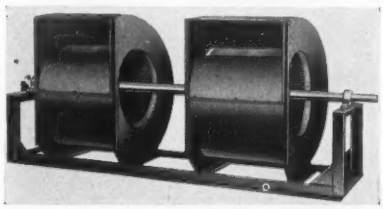
✦ ✦ ✦

IN 1932, about 2.6 pounds of welding wire were produced for every ton of finished steel products manufactured.

✦ ✦ ✦

New Blower Units Announced

PRODUCTION of Motor Blower Units in a wide range of sizes is announced by the **Niagara Blower Company**, 6 E. 45th St., New York City. The new blower units are applicable to industrial and



commercial ventilating, drying, heating, cooling, exhausting, processing and air conditioning requirements.

THE Niagara Blowers are available in sixteen models. These are produced in one, two and three-fan assemblies to meet resistance up to 4″ S.P. and in capacity from 880 C.F.M. to 42,600 C.F.M. Fan speeds range from 300 R.P.M. to 1750.

✦ ✦ ✦

THE blowers may be secured with or without casings, belt-driven or direct connected, and are especially designed for simplified application to duct systems. Because of the wide variety in types of blowers, a proper selection may be made for successful operation of all industrial and commercial applications.

✦ ✦ ✦

UNITS are available in two series of fan designs. Series 1100 gives large volumes of air with quiet operation at low fan speeds for static pressures up to 1½″. Series 1200 meets the resistance of duct systems and special conditioning equipment, protecting motors from overload by a retarded horsepower curve, for static pressures up to 4″.

Why Syncro equipment leads in processing substitute materials

Because Syncro equipment is designed by men who are familiar with your problems and because it is precision built in accordance with the best modern practice, it produces high quality products at the lowest possible operating and maintenance costs.

Whether you are interested in WIRE DRAWING MACHINES for either non-ferrous or steel wire, TAPING HEADS, CAPSTANS, ANNEALING and TINNING equipment, cable TAKE-UPS, RODBLOCKS or allied machinery, we believe you will get the most for your money by specifying Syncro.

May we quote on your requirements?

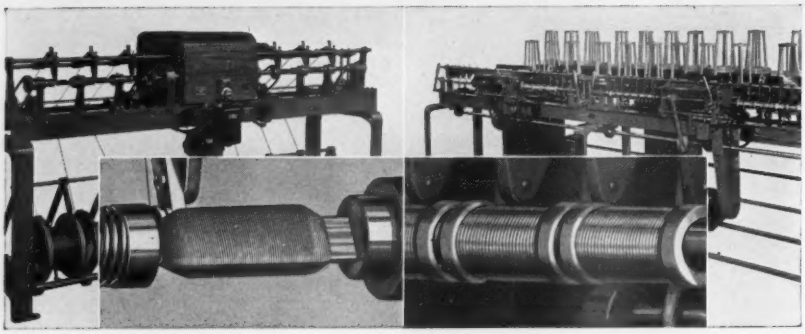
SYNCRO MACHINE COMPANY
420 LEXINGTON AVE., NEW YORK
McCORMICK BLDG., CHICAGO

REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

Machinery for the Wire Industry

SYNCRO

WIRE SPOOLING MACHINES



On Sticks or Spools . . . from Reels or Coils

Typical of FIDELITY Spooling Machines that you find serving every spooling-operation need of wire industry, these two new types command attention to advanced achievements in precision winding of the wire onto little flat sticks or conventional spools, at new high production rates and new low spooling cost.

You'll be interested especially in the new FIDELITY hydraulic control which eliminates gear changes . . . so write for Bulletin #61.

WIRE SPOOLING, TAPING, WINDING, SINFRA KNITTING, BRAIDING MACHINES

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.

700 Spools an hour!

Assembly of Clark *All-Metal* Spools is made under a patented process at the rate of 700 an hour, on either hand or power press. No spot fitting necessary. Thus — increased output, reduced cost.

Clark Spools are strong because of the embossing and curled edges of the ends, nibs in the plug which prevent turning of end on barrel, and because the whole circumference of the barrel is locked into plug and end.

Made in 5″, 6½″ and 10½″ diameter ends; barrels in 1 15/16″ diameter (or special 3½″ diameter for 10½″ end) in any length. Material is cold rolled steel in gauges to meet your demands for strength.

Samples and prices will be sent at your request.

★

J. L. CLARK MANUFACTURING CO.

600 23rd Avenue
ROCKFORD, ILLINOIS

★

901 Chrysler Building
NEW YORK, NEW YORK

Training of Labour

(*Continued from Page 300*)

from the production point of view, than newly engaged hands. Such moves are unlikely to be of regular occurrence in view of the reduction of a skilled hand to the standing of an unskilled one, but when such transfers do become necessary it is a good thing to have such transferees undergo a brief 'refresher' course. Such intensive training as is meted out to new hands will not be their lot in view of the fact that they will benefit from the experience already behind them, and should pick up the rudiments of their new work with consummate ease.

✦ ✦ ✦

IN the case of newly engaged hands it is essential to state at the time of employment that a minimum period of time will be allocated for purposes of training during which period a basic rate of remuneration will be paid with, perhaps, a weekly bonus for progressive efficiency. It must be a condition of the engagement that the employer is fully entitled to dispense with any hand who, on completion of the initial training period has the appearance of being unsatisfactory and consequently unremunerative.

✦ ✦ ✦

ASSUMING that a certain factory has a full staff of 500 men of whom 300 have, at some time or another, gone through the training establishment for a period of two weeks. The individual cost of that training may have been $10 a head. This expense involves the creation of a latent economic asset of $6000 which is an adequate surety for the establishment of a higher rate of productive capacity and efficiency and a lower scale of manufacturing wastage.

✦ ✦ ✦

Conclusion

IT will be the objective of the factory principal to see that any occurrence likely to negative the value of the latent asset is not permitted to arise whether this takes the form of labour transfer, labour dismissal or labour absenteeism. It will be found that from the careful application of a proven system of training, the factory cannot but de-

rive benefit in the shape of lowered costs of production, an ever-developing efficiency ratio and thereby, a gradual reduction in the unit output cost.

✦ ✦ ✦

Metal Duplicating Without Dies

THE above is the title of a new catalog that has just been published by the O'Neil Irwin Mfg. Company, Minneapolis, Minn., which describes the Di-Acro system of metal forming without dies.

✦ ✦ ✦

THE book gives a history of the development of the Di-Acro system, illustrates and describes the various types of machines available, pictures kinds of work that can be turned out, describes applications by various companies, has a Q. and A. chapter on their several units and describes the engineering service available to purchasers of equipment.

✦ ✦ ✦

THE Di-Acro System of forming or duplicating without dies is extremely versatile in its applications for producing parts or pieces of intricate shapes. Many materials besides metals can be worked. In addition to stamping and forming for small quantities, and experimental, research and testing uses—in many cases multiple units of Di-Acro Machines are proving profitable for production line work.

✦ ✦ ✦

THIS book should be of interest to many wire products fabricators and a copy may be had by addressing the Company at the above address.

Got Any *Special* Drawing Problems?

They need your wire faster and in greater quantity today. Maintaining quality and costs in the face of this demand has undoubtedly developed drawing problems which call for compounds better adapted to the situation than the materials which may have been fully satisfactory under normal conditions.

MAGNUS 57WD has proven itself a superior and more economical compound for dry drawing low and medium carbon wire. Have you tried it?

The Magnus line of wire drawing compounds has always been unusually complete. One of these tested and proven materials may be just what you need for today's production. If not, we are anxious to work with you in developing specially compounded materials to meet your needs wherever they are indicated.

Won't you call us in on any problems you have along these lines?

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Manufacturers of Cleaning Materials, Industrial Soaps and Metal Working Lubricants.
188 South Avenue Garwood, N. J.

MAGNUS CLEANERS

It's GOOD! It's NEW!

It's GOOD NEWS to WIRE MEN!!!

Here's Why:

APEX "PIC-KLEEN" *eliminates* lime in many cases; a valuable *addition* to lime in *all* cases.

APEX "PIC-KLEEN" *entirely* eliminates time-consuming *sull-coat* operation.

APEX "PIC-KLEEN" is the finest *rust-inhibitor* for pickled wire under adverse storage conditions.

APEX "PIC-KLEEN" conserves dies and lubricants.

FOR USE ON ROUNDS *AND* SHAPES; ON HIGH OR LOW CARBON WIRE.

Negligible cost makes your inquiry imperative.

Address inquiries to:

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MAIN & RECTOR STS., PHILADELPHIA, PA.

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ATLANTIC CITY, N. J.
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European Plan—
Moderate Rates
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ALL OUTSIDE ROOMS,
MOST OF WHICH
HAVE OCEAN VIEW
★
AMPLE LOBBIES
AND PARLORS IN
A SPIRIT OF HOME-
LIKE REFINEMENT
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Write for
Literature and Rates
William Kneller, Owner

New Degreasing Compound Substitute for Trichlorethylene Degreasing

ANNOUNCEMENT is made of a new mineral grease and dirt digestive solvent. According to A. F. Curran, Research and Development Chemist, the new grease digestant is available in the form of a concentrate, which may be diluted with a grease solvent before use to charge large open cleaning tanks or vats. It is called GUNK XII.

✦ ✦ ✦

IT is stated that the digestive solvent is a superior substitute for Trichlorethylene vapor phase metal cleaner, particularly where there is much insoluble dirt or smut to be removed. The marketing of the product is announced at a time when there are shortages of all chlorinated solvents.

✦ ✦ ✦

THE cleaning method is carried out by cold immersion of greasy or dirty parts. This solvent, it is said, not only takes the cling out of hard mineral dirt and grease accretion, but emulsifies them as well, so that they may be instantly and completely rinsed away by sluicing with a water hose.

✦ ✦ ✦

THE removed oil and dirt disappears in the form of a milky oil-in-water emulsion which does

STEEL WIRE
By MAURICE BONZEL
✦ ✦ ✦
Translated and Published by
Kenneth B. Lewis
Consulting Engineer
✦ ✦ ✦
Price $15.00
✦ ✦ ✦
495 pages—414 illustrations
✦ ✦ ✦
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WIRE and WIRE
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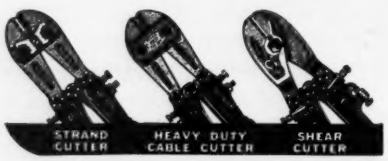
300 Main St. Stamford, Conn.

If you MAKE or USE WIRE
YOU NEED ONE OF THE MANY
Porter Cutters
Indispensable in wire mills for sampling large wire.
In almost universal use by wire fabricators for cutting reinforcing fabric, fencing, spring wire, etc.
Useful in any plant—large or small—for all sorts of maintenance and repair work—for cutting bolts, rods, wires, rivets, wire rope, chains, or for splitting deformed or "frozen" nuts.
There is a standard Porter tool for every cutting job up to ¾" annealed bolts or ½" hardened chains. Special cutters designed to fit your industry's needs.
Send for Catalog of PORTER CUTTERS.
H. K. PORTER, INC.
EVERETT, MASS.
SEND FOR CATALOG



not clog sewer drains, or create a fire hazard. The process, it is stated, makes possible grease cleaning operations on a large scale with small investment in equipment. Simple rectangular tanks of suitable dimensions, and having an over-all capacity of at least 300 gallons, is necessary, and vapor degreasing tanks may be converted to the new solvent digestive and emulsifying method by shop labor.

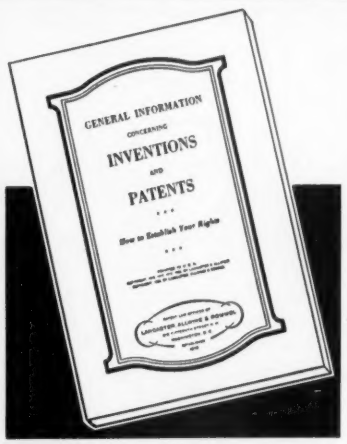
✦ ✦ ✦

LONG life and low cost, as well as high performance of the new digestive solvent, is claimed for this cold emulsion tank method of metal cleaning.

✦ ✦ ✦

ENGINEERING data sheets are available on request. Write **Curran Corporation,** Malden, Massachusetts.

When writing your suppliers, please tell them you saw their advertising in WIRE & WIRE PRODUCTS. It helps them and it helps us. Because of their advertising we are able to render a valuable editorial service to our field. It's the American Way!



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No charges are made for preliminary advice, either in connection with patent, trade-mark or copyright cases.

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WIRE FOR A THOUSAND USES

Continental SUPERIOR wire is used in the manufacture of hundreds of everyday items. This versatile wire is produced in sizes from 34 gauge to ⅝ inch, in standard and many special shapes . . . and in correct analyses, tempers and coatings to fill exacting requirements. The different combinations of specifications available are numbered in thousands.

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(The Superior Sheet Steel Co., Canton, Ohio — a subsidiary

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SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.

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Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
Stamford Trust Co. Bldg.,
300 Main St. Stamford, Conn.

Government Wire Production Information

(Continued from Page 307)

Nails Escape Ax — WPB Asks More of Them

BECAUSE lumber is largely replacing steel in wartime building construction, nail manufacturers are being asked to increase production during coming months.

✦ ✦ ✦

TWENTY-SIX common nail manufacturers have been authorized by the Director of Industry Operations to produce a total of 72,000 tons of nails a month during April, May, June and July. The announcement was made by C. E. Adams, chief, iron and steel branch.

✦ ✦ ✦

NAIL production averaged 55,000 tons a month in 1940 and had climbed to 65,000 tons a month by 1941.

✦ ✦ ✦

NAIL manufacturers have been directed to sell their products only on orders carrying preference ratings. Large consumers buy a portion of the output directly from

(Please turn to Page 320)

FREE!

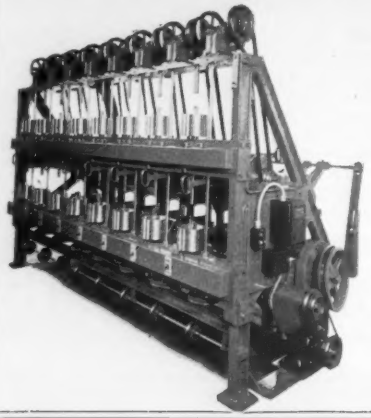
to Wire Mill Production Managers and Superintendents interested in the NEWEST pickling developments . . .

THIS 12-PAGE DATA MANUAL

Contains tested ideas and methods for increasing efficiency of production pickling and neutralizing operations. Describes Oakite Pickle Control . . . how it helps save acid, conserve metal . . . how to eliminate over-pickling, reduce acid fumes, inhibit rust. Remember, your copy is FREE, so won't you write for it today?

OAKITE PRODUCTS, INC.
52A THAMES ST. NEW YORK, N. Y.
Representatives in All Principal Cities of U. S. and Canada

OAKITE CERTIFIED CLEANING
MATERIALS METHODS SERVICE



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2D8-MBB Machine
for applying
FIBERGLAS,
COTTON AND PAPER
Each Unit Individually
Motor Driven
WIRE MACHINES FOR
Drawing, Enameling, Tinning, Spooling,
Multiple Pull-outs, Rubber Covered
Wire Panners, etc.

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MACHINERY
COMPANY
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FOR DEFENSE
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FOR COMMERCE

ROBINSON Stranders meet the requirements of the industry; which is called upon to furnish stranded wire in ever increasing quantity.

Robinson Engineers will give your inquiries their prompt and careful attention. Write —

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WIRE MILL EQUIPMENT *by* "STANDARD"

TURKS HEADS
Adjustable draw plates—accepted by wire trade as accurate, efficient means of producing rectangular and special shapes. With friction or power driven rolls. Catalog TH.

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8 sizes, 2 general types. Machines are of one-man type with all controls at die end. Catalog DB.

ROLLING MILLS—STRIP AND WIRE
Roller bearing and plain bearing mills; many regular sizes or made to suit user's specific needs. Write fully.

SWAGING MACHINES
For reducing diameter of tubular and solid bar stock into cylindrical, conical, or "necked" shapes. Capacities from ½" tube, ¼" solid to 6" tube or 3¾" solid. Catalog SM.

ALSO
Hand Screw, Foot, and Power Presses; Drop Hammers, and Scrap Bundlers.

✓ your needs for this equipment and write for catalogs.

STANDARD MACHINERY CO., PROVIDENCE, R. I.

250 TUBE BENDS PER HOUR

Girl operator makes 1000 Tubes per day. Forming 125 steel tubes per hour with 2 accurately placed, uniform bends is "duck soup" for the handy and versatile Di-Acro Bender No. 1, which also bends angle, channel, wire, moulding, strip stock . . . Together with the Di-Acro Shear which squares or strips, makes slits or notches, and the Di-Acro Brake which forms angles, channels, "Vees", etc.—a great variety of metal parts can be formed to duplicated accuracy of .001"—Metal Duplicating Without Dies!

DI-ACRO PRECISION MACHINES

Write for Catalog

O'NEIL-IRWIN MFG. CO.
303-8th Ave. S., Minneapolis, Minn.

"The girl operator forms about 125 pieces per hour or 1000 in an eight-hour day on this machine. It has been more than satisfactory,—paid for itself in about 15 days."
BOBRICK MFG. CORP., Los Angeles, Calif.

Government Wire Production Information

(*Continued from Page 319*)

manufacturers, but jobbers still distribute a large percentage of total production.

✦ ✦ ✦

Copper Conservation Order Changed

TWO changes in the copper conservation order, M-9-c, are announced by the Director of Industry Operations.

✦ ✦ ✦

THE first permits a person who has frozen brass mill or wire mill products to sell them to any brass mill or wire mill without obtaining approval from the War Production Board. Previously, such frozen copper products could be sold only to the mill from which they were originally purchased. Purpose of the amendment is to facilitate sales of frozen inventory.

✦ ✦ ✦

THE second change corrects an error. M-9-c as amended on May 7 included "Locks" on List "A" of the order. It should have been on List "A-1". The amendment makes this change, which permits manufacture of locks until May 31.

✦ ✦ ✦

Hot Dip Tinning of Carbon Steels

(*Continued from Page 299*)

an increase in silicon or manganese causes an increase in the thickness of this alloy layer; however, it is not safe to say that a high silicon heat will have a thicker tin-iron alloy than a low-silicon heat because other variables in the open hearth, pouring, and rolling practice overcome the effect of silicon.

Part I of this article was published in the May issue of WIRE & WIRE PRODUCTS and covered (1) Introduction, (2) Previous Work, and (3) Description of Steels Used and Preparation of the Tinned Samples of Each Steel.

Part III published in July will continue the above subject and will contain (3) Thickness of Tin Coating, (4) Determination of the Number of Pin-Holes or Discontinuities in the Tin Coating, (5) Conclusions and Discussions of Conclusions, (6) Table of References.

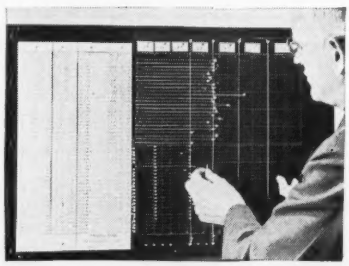
"Produc-Trol" Co-ordinates 2-And-3 Shift Operation

BUSY industries in every classification, working on both war and civilian orders, are welcoming the new "Produc-Trol" system. Use of this ingenious device enables production and purchasing executives to quickly see all facts concerning raw materials, parts, assemblies, machine and man hours. Information of this kind is especially essential where multiple-shift production is maintained.

✦ ✦ ✦

"PRODUC-TROL", which was developed by the Wassell Organization, Westport, Conn., lists parts, assemblies, sub-assemblies, or individual operations on a part, at the left of the board. Movable tapes working from left to right on pulleys bring all pertinent facts into instant focus. Double rows of peg holes under the movable tapes, and various colored pegs, permit many arrangements of comparative data and control, required for any operation. "Produc-Trol" units can be ordered in sizes to fit specific needs; models are also available for individual and group incentive plans.

✦ ✦ ✦



BOOKLET giving complete data and specifications available from **Wassell Organization,** Westport, Conn.

✦ ✦ ✦

Establishes New Branch

IN line with its recently expanded service policy in the metal cleaning industries, the **Detroit Rex Products Company** announce the opening of a New England branch office at 8 West Main Street, Meriden, Connecticut, telephone Meriden 688.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
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WIRE DRAWING LUBRICANTS
HIGH OR LOW CARBON WIRE, COLD HEADING,
BRIGHT AND WET WIRE DRAWING.
STANDARD "WIRE DRAW"
SPECIALLY ADAPTED FOR HIGH SPEED DRAWING MACHINES
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STANDARD INDUSTRIAL COMPOUNDS CO.
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FOR SWAGING, STAMPING, PIERCING, BLANKING, FORMING OF COILED METAL
WE also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.
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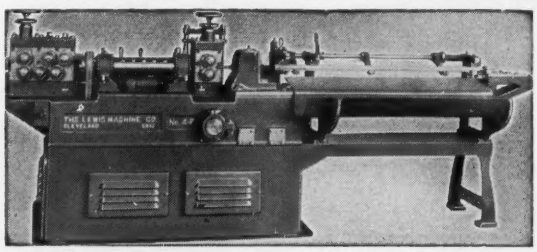

Machines for 1/16" to 3/4" rod
Round
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Ferrous and Non-Ferrous

Automatic
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WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

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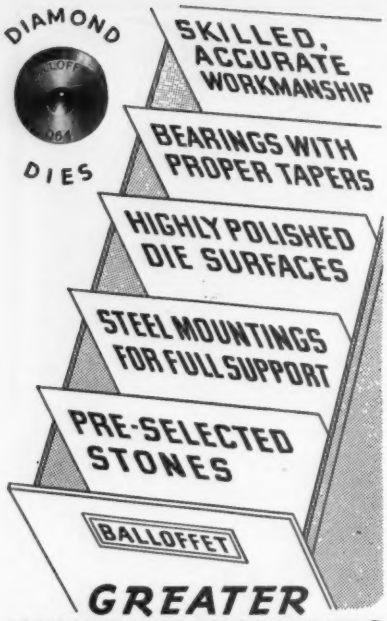

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BALLOFFET
DIES AND NOZZLE CO., Inc.
6825 Adams St., Guttenberg, N. J.
Quality Diamond Dies Since 1870

For Best Results, Use

WILLEY'S
TUNGSTEN CARBIDE DIES

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They have exceptional abrasion resistance, are free from porosity and take a high polish. Standard one-piece round dies from stock in many sizes. Four classifications from blank and rough cored nibs to finished dies, ready to use.

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MANUFACTURERS AND SPECIALISTS IN
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Handy Wire Data Card Free to Engineers

THE Callite Tungsten Corporation is offering without charge a handy and indestructable wire data chart that will be useful to every engineer who has occasion to employ wire in his designs or specifications.

✦ ✦ ✦

ON its face in columnar tabulation are given the B & S, Washburn & Moen, and the Stubs or Birmingham diameters for gauge sizes 1 to 50. In addition, the B & S column shows feet per pound for each size of standard 5% phosphor bronze. Directly below this chart is a table of conversion factors for use in obtaining the ft./lb. values for 15 other common wire materials. Along one edge is an inch rule, divided into 16ths.

✦ ✦ ✦

ON the reverse side is a tabulation which gives for each of these 15 the details of:

(1) nominal analysis composition
(2) approximate tensile strength for hard and soft grades, in pounds per square inch
(3) approximate percentage of elongation for hard and soft
(4) density in pounds per cubic inch.

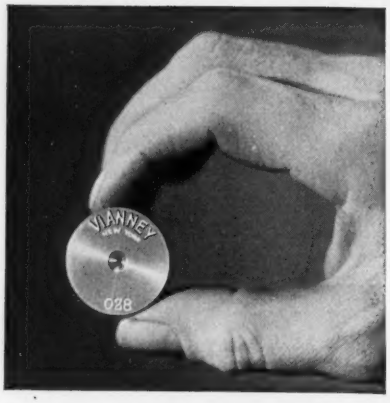
✦ ✦ ✦

THE card is of heavy white celluloid with the data printed thereon in black and red. The overall size, 5¼" x 3" is convenient for the vest pocket, to slip under the glass desk top, bind into a pocket loose-leaf book, etc.

✦ ✦ ✦

ANYONE desiring one of these wire data cards can obtain same by addressing a request to **Callite Tungsten Corp.**, Wire Division, Union City, N. J.

VIANNEY
Famous Wire Drawing Diamond Dies



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ATTLEBORO, MASS.
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EST. 1917
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EQUIPMENT AVAILABLE FOR REDRAWING ROUND WIRE
Less Ton Lots A Specialty
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LOWELL, MASS.

UNIVERSAL WIRE REEL
Quickly and easily adjusted to any angle within 90 degrees. Cut shows one angle.
Write for circular R
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

WIRE MACHINERY SPECIALISTS
3—Nilson No. 1, 3 & 4 4 Slide Wire Machines
5—Baird No. 4—Four Slide Wire Machines
7—Waterbury Step Cone Wire Drawing Machines
1—Two Spindle Bull Block Motor Driven
6—Lewis Welding Wire S. & C. Machines M. D.
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Wanted: Tack Making Machinery. All Sizes.
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New or Second-Hand Wire
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F. H. CRAWFORD & CO., INC.
30 Church St. New York City

Plastics in Industry

THE Chemical Publishing Company, 235 King Street, Brooklyn, N. Y., has published a book on plastics.

✦ ✦ ✦

INTENDED primarily for the industrialist who is seeking new raw materials for economic or utilitarian reasons, it nevertheless should be of interest to persons in the electrical wire industry concerned with the use of these materials.

✦ ✦ ✦

THE contents cover a wide range of subjects: Definitions and the Plastics Industry; Thermoplastic and Thermosetting Resins; Specifications; Molding and Fabrication Technique; Engineering and Chemical Machinery and Plant; The Electrical Industry; Aircraft Construction; Motor-Car Manufacture; Textile Industry; Building Industry; Synthetic Glues; Synthetic Rubber in Modern Industry; Fancy Goods Trade; Furniture Manufacture; Packaging and Display; Miscellaneous Design.

✦ ✦ ✦

"PLASTICS in Industry" ($5.00) is a technical handbook, the text of which is liberally supported with illustrations, diagrams, and tables and covers, the materials discussed ranging from celluloid to synthetic rubber.

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Featuring —
High Speed Upright Cone Machines.
Also —
Bull Blocks and Benches, Continuous Wire Drawing Machines, Spoolers, Pointers, String-up Machines, etc.
And —
Cold Heading Machinery.
WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn.

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THE PLATT BROS. & CO.
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Designers and Builders of Gas-Fired Heat Treating Furnaces for Ferrous and Non-Ferrous Wire.
SURFACE COMBUSTION
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Machinery For
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Rod Frames — 16" Frames, 8" Frames — Take-Up Frames, Wire Pointers — Puller Tongs.
General and heat resisting alloy castings for wire mill use.
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Wire Mill and Cold Rolling Equipment
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Division of
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WICKLIFFE, OHIO
Leading manufacturers of
OVERHEAD MATERIALS HANDLING EQUIPMENT
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"THE SHIFTWEIGHT"
TILTING WIRE REEL
One man loading reel = for wire coils up to 300 pounds.
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CLEVELAND, OHIO

Notice to Members of the Co-operating Societies, National Metal Congress

DEFINITE information has been received from **Mr. J. Lee Barrett** of the Detroit Convention and Tourist Bureau that the Army has contracted for the Michigan State Fair Grounds, with immediate possession. This of course eliminates the Fair Grounds and the city of Detroit for the National Metal Congress and the War Production Edition of the National Metal Exposition.

✦ ✦ ✦

AS stated previously, an option was taken on the Cleveland Public Auditorium and the entire facilities of all Cleveland hotels for the Congress and Exposition the week of October 12 to 16, 1942. It is the intention of the Society to take up the option and complete details for holding these events in Cleveland.

✦ ✦ ✦

AS reported previously, the Cleveland Hotel is available as headquarters of the American Welding Society, the Carter Hotel or the Hollenden Hotel for the Wire Association, and the Hotel Statler for the American Institute of Mining & Metallurgical Engineers divisions and the American Society for Metals.

✦ ✦ ✦

THE floor plan for the Cleveland Public Auditorium is near completion and this and other announcements will be sent without further delay.

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WIRE MACHINERY COMPANY
SUBSIDIARY OF THOMSON-GIBB ELECTRIC WELDING COMPANY
LYNN, MASSACHUSETTS
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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BERYLLIUM COPPER — Strip and Bars
Callite Tungsten Corp., Union City, N. J.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES AND SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

WHERE TO BUY, Continued

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.

COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Wire Drawing
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CONTROLS—Heat Treating
Niagara Blower Co., Buffalo, N. Y.

CONTROLS—Temperature
Niagara Blower Co., Buffalo, N. Y.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Callite Tungsten Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIE MAKING MACHINERY — For Forming Special Shapes
O'Neil-Irwin Mfgr. Co., Minneapolis, Minn.

DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Jersey City, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Jersey City, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING EQUIPMENT—
Niagara Blower Co., Buffalo, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Humidifying
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Industrial Cooling
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKER—
Carl-Mayer Corp., The, Cleveland, Ohio.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Hardening and Tempering
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING EQUIPMENT—
Wilson, Lee, Engineering Co., Cleveland, O.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—ROLL
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

KETTLES — Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LUBRICANTS—For Metal Cutting Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfgr. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engineering Co., Cleveland, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Erie Corp., Erie, Pa.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.

Machinery—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

WHERE TO BUY, Continued

OILS—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.

WIRE DRAWING — High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

Custom built spools for high speed winding

Mercury testing for continuity of film

Checking raw materials

Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY— All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

SERVICE—If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples and Litzendraht.

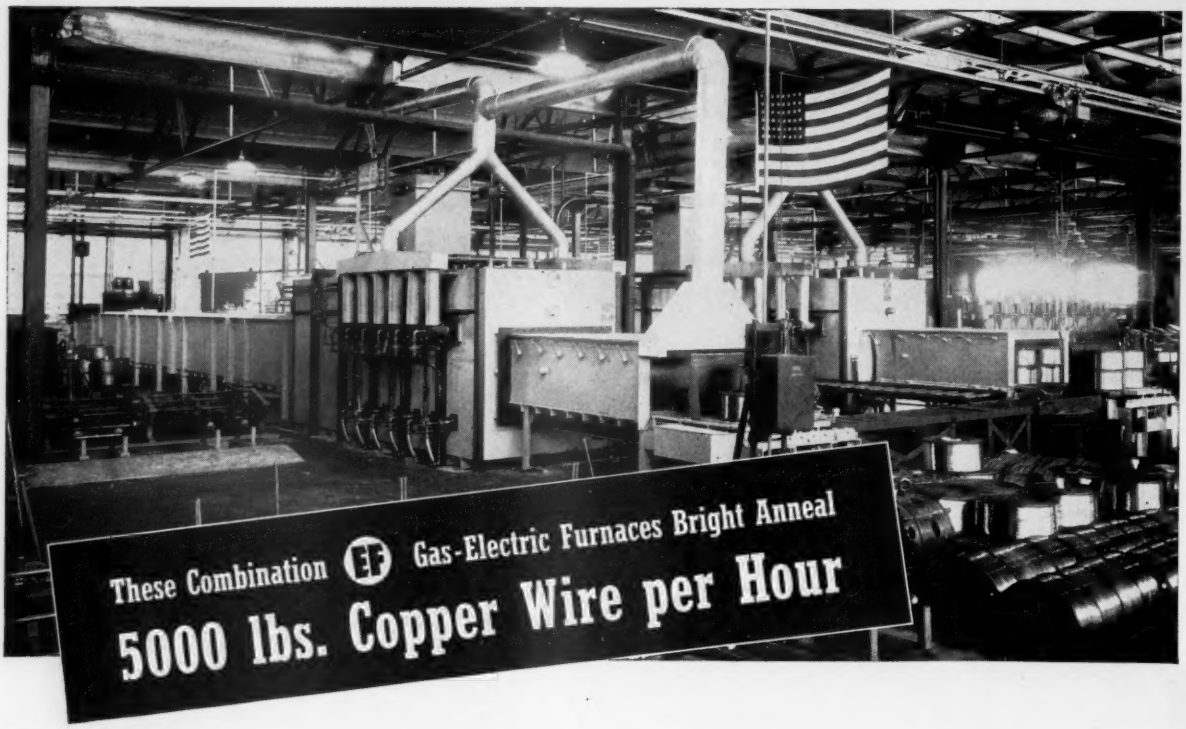
HUDSON WIRE CO.

Winsted Division

WINSTED CONNECTICUT

EF FURNACES

For Every Industrial Heat Treating Process



Equipped With

EF Gas-Fired Recuperative Type Radiant Tubes

Bright, uniformly annealed copper wire—at the rate of 2½ tons per hour—is produced continuously in the above combination gas-electric, controlled atmosphere furnace. These furnaces handle rod in coils up to 36" in diameter and wire on reels up to 21" in diameter. The material is carried through the furnaces on bulkhead type trays which provide an effective seal for the protective atmosphere used in the equipment. These trays eliminate the necessity of doors, lock chambers, or other sealing devices at either the charging or discharging ends of the furnaces.

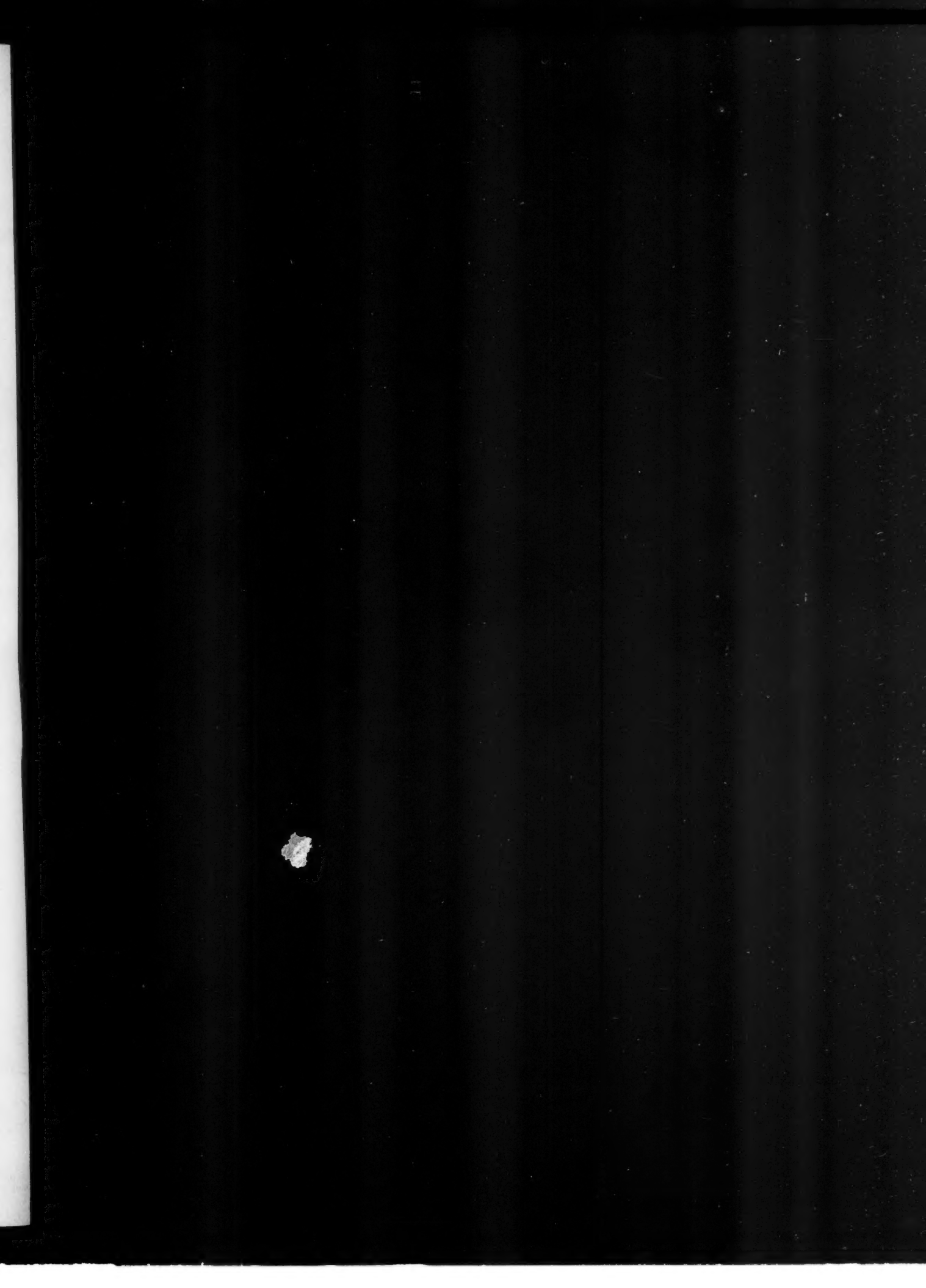
The heating chambers are divided into two separately and automatically controlled zones. The first or charging zone of each furnace is heated by EF gas fired recuperative type radiant tubes. The soaking zones are heated by heavy V-type cast alloy heating elements.

The heating elements in each zone are located above and below the charge and extend the entire width of the chambers, insuring absolute temperature uniformity throughout the charge.

The protective atmosphere is produced in an EF generator located between the furnaces.

Other recent outstanding production furnace installations include furnaces for bright annealing both ferrous and non-ferrous strip, wire, tubing and other products, . . . furnaces for the production heat treatment of tank armor castings, cartridge cases, shell forgings, bomb and gun parts, machine gun cartridge clips, aircraft and aircraft engine parts, aluminum and magnesium castings, bolts, springs, and many other allied products.

We specialize in designing and building production furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production